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# Monthly Message

During World War I the British backed Husein, Grand Sherif of Mecca, in the revolt of the Arabs from Turkish rule with the intent eventually to form an Arab state or confederation. T. E. Lawrence, Oxford graduate and archeologist, had lived for many years in the Near East. With the backing of Sir A. H. McMahon, High Commissioner in Egypt, and Sir Ronald Storrs, Military Governor of Jerusalem, he joined with the Arab armies under the sons of Husein. These armies contributed in large measure to the final triumph in the Near East.

In Lawrence's *Seven Pillars of Wisdom,* written a few years after the war, the following extraordinary paragraph appears in the early pages:

> Arabs could be swung on an idea as on a cord; for the unpledged allegiance of their minds made them obedient servants. None of them would escape the bond till success had come, and with it responsibility and duty and engagements. Then the idea was gone and the work ended—in ruins. Without a creed they could be taken to the four corners of the world (but not to heaven) by being shown the riches of earth and the pleasures of it; but if on the road, led in this fashion, they met the prophet of an idea, who had nowhere to lay his head and who depended for his food on charity or birds, then they would all leave their wealth for his inspiration. They were incorrigibly children of the idea, feckless and colour-blind, to whom body and spirit were for ever and inevitably opposed. Their mind was strange and dark, full of depressions and exaltations, lacking in rule, but with more of ardour and more fertile in belief than any other in the world. They were a people of starts, for whom the abstract was the strongest motive, the process of infinite courage and variety, and the end nothing. They were as unstable as water, and like water would perhaps finally prevail. Since the dawn of life, in successive waves they had been dashing themselves against the coasts of flesh. Each wave was broken, but, like the sea, wore away ever so little of the granite on which it failed, and some day, ages yet, might roll unchecked over the place where the material world had been, and God would move upon the face of those waters. One such wave (and not the least) I raised and rolled before the breath of an idea, till it reached its crest, and toppled over and fell at Damascus. The wash of that wave, thrown back by the resistance of vested things, will provide the matter of the following wave, when in fullness of time the sea shall be raised once more.

Frank B. Berry

FRANK B. BERRY, M. D.
Assistant Secretary of Defense
(Health and Medical)

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# Foreword

The *United States Armed Forces Medical Journal* is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense. The Assistant Secretary of Defense (Health and Medical) and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this *Journal.*

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UNITED STATES ARMED FORCES
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# SEVERE DYSBARISM IN ACTUAL AND SIMULATED FLIGHT

## A Follow-Up Study of Five Cases

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DYSBARISM lurks as a constant potential hazard in all high altitude flight. This complex of symptoms resulting from exposure to decreased or changing barometric pressure may have severe manifestations at altitudes as low as 22,000 feet. Severe cases may result from exposure to actual altitude in flight or to simulated altitude in the low pressure chamber. Several such cases were reported previously by one of us.[1] In spite of magnificent engineering advancements, many of our aircrews continue to be exposed to cabin altitudes in excess of 20,000 feet.

In previous reports[2,3] the source of the chamber reactor reports was discussed and the lack of a comprehensive reporting system for in-flight dysbarism incidents was deplored. Steps have been taken to remedy this situation. The need for a follow-up study and a proposed outline of such a study were also discussed. Recently, we had the opportunity to conduct follow-up examinations on two in-flight and three chamber dysbarism cases. The presentation of the pertinent details of the original dysbarism incidents and the follow-up examinations is the purpose of this paper.

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From U. S. Air Force School of Aviation Medicine, Randolph Air Force Base, Tex.
Presented at the Third European Congress of Aviation Medicine, Louvain, Belgium, 23-27 September 1958.

## CASE REPORTS

*Case 1.* This 33-year-old officer[4] participated in a chamber flight in March 1954. He was moderately obese, 72 inches tall, and weighed 195 pounds. The chamber was decompressed at a rate of 1,000 to 3,000 feet per minute. He was on 100 per cent oxygen from ground level. He noted pain in the abdomen at 35,000 feet, and attempted to relieve it by belching and passing flatus. This pain was not severe, and ascent continued to 43,000 feet. Thirty seconds after reaching 43,000 feet the officer placed his hand to his forehead to indicate dizziness or discomfort, then rubbed his shoulders to indicate pain. The chamber altitude was immediately dropped (simulated free-fall) and at 30,000 feet the patient lost consciousness and urinated involuntarily. The oxygen regulator was then turned to the emergency setting. The chamber reached ground level in less than four minutes and the officer was semicomatose. He was immediately placed on a stretcher, continued on 100 per cent oxygen, and taken to the recovery room.

He complained of dizziness, twitching of the eyelids, numbness of both arms (particularly the elbows), mild generalized cephalalgia, and blurring of vision. His blood pressure was recorded as 150/80 mm Hg, and nystagmoid eye movements, cool, moist skin, and hyperesthesia of the forearms were present. Dextran was started intravenously. After observation for an hour in the recovery room the patient was moved by litter to the hospital ward. During the movement the patient became pale, began to sweat profusely, and vomited clear material. His pusle became more rapid and weak.

On admission to the hospital, the patient's blood pressure was unobtainable, his pulse was weak with a rate of 150 per minute, respirations were 40 per minute and shallow, the skin was cold and moist, and marked pallor was evident. Conventional shock therapy was instituted. Two and one half hours after admission to the hospital the patient's blood pressure stabilized at 120/70 mm Hg, his pulse was 96, and his respiratory rate was 16 per minute. He complained of dizziness, frontal headache, blurred vision and paresthesia of both forearms. Examination revealed bilateral nystagmus, diminished corneal reflexes, and sluggish pupillary reactions to light. The abdomen was moderately distended but peristalsis was normal. Six hours after admission the patient became extremely restless and confused and a lumbar puncture was performed. Initial pressure was 260 mm of water. Twelve ml of spinal fluid was slowly removed. Closing pressure was 140 mm of water. The spinal fluid was clear, with 17 cells (7 polymorphonucleocytes and 10 lymphocytes); sugar was 36 mg; chloride, 715 mg; and total protein, 98.7 mg, all per 100 ml. Following lumbar puncture the patient developed carpopedal spasm and rapid respiration, and lapsed into a restless coma.

Approximately 24 hours after admission to the hospital, signs of right hemiparesis appeared and the patient gradually developed fixed pupils, absent corneal reflexes, Cheyne-Stokes respiration, loss of abdominal and cremasteric reflexes, and strong Babinski, Chaddock, and Oppenheim signs on the right. Signs of possible tracheal obstruction

due to tenacious secretions became apparent and a tracheotomy was performed 31 hours after the onset of neurocirculatory collapse. Following this procedure, the patient's respirations became regular. Five days later the neurologic examination findings were within normal limits. Treatment after the acute phase consisted mainly in supportive care, and the patient remained in the hospital until the tracheotomy incision was closed. Laboratory studies are summarized in table 1.

Twenty-four days following the incident the patient was discharged to duty, and four days later returned to flying status. Since his return to flying status, this officer has been flying in conventional type aircraft and has never exceeded an actual altitude of 20,000 feet.

He was re-examined at the School of Aviation Medicine in 1958. Complete neurologic, psychiatric, psychologic, and physical examinations were entirely within normal limits except that the patient was obese and appeared older than his stated age.

*Case 2.* This 37-year-old officer is a command pilot with 4,376 hours of military flying time, 315 hours of which have been flown in jet aircraft, predominantly in the B-47 and B-52.

In June 1943 he experienced an episode of dysbarism in the altitude chamber. At that time he was 23 years of age and was in fairly good physical condition, being 69 inches in height and weighing 170 pounds. As the altitude approached 38,000 feet during the chamber flight, he noted numbness in his right arm. Seconds later the arm became uncontrollable and he described it as flying out to the extended position. Immediate descent was initiated, and during descent he became unconscious. He was admitted to the hospital where neurologic examination revealed a right hemiparesis. Approximately 48 hours later the patient regained consciousness with complete resolution of the hemiparesis. He remained in the hospital for five days and then went on 30-day convalescent leave. Following his return from leave he was given a complete physical examination, and all findings were within normal limits.

Since 1943 he had accumulated at least 12 hours of flying at a cabin altitude above 30,000 feet. In February 1958, while he was flying in a B-52, cabin pressure could not be maintained and he flew for one hour at a cabin altitude of approximately 33,000 to 35,000 feet, and experienced no difficulties. During this same time interval he had participated in four routine physiologic training flights without untoward incident.

On the morning of 11 July 1958, however, this officer entered the chamber for the purpose of another routine flight. He was taken to 8,000 feet and returned to 1,500 feet for an ear check. No difficulties were encountered and with the oxygen regulator set on the normal setting, he was taken to an altitude of 43,000 feet in 25 minutes. This altitude was maintained for one and one half minutes and positive pressure breathing was performed. The altitude was then decreased to 35,000 feet and maintained for 5 minutes. The altitude was then further decreased to 30,000 feet and the patient removed his oxygen

TABLE 1. *Summary of laboratory studies in cases of dysbarism*

| | Time after admission | | | | | | |
|---|---|---|---|---|---|---|---|
| | Initial | 4 hours | 12 hours | 20 hours | 24 hours | 48 hours | 72 hours |
| Case 1 | | | | | | | |
| WBC | | | | 20,000 | 16,000 | 12,600 | |
| RBC | | | 5,600,000 | 4,900,000 | | 3,900,000 | |
| Hb* | 15.6 | | 16.3 | 14.8 | 14.8 | 14.5 | |
| HCT** | 54 | | | 49 | 46 | | |
| Urine | specific gravity too high to read; sugar, trace; acetone, trace; albumin, negative | | | specific gravity, 1.040 sugar, 2 + | | | |
| Case 2 | | | | | | | |
| WBC | 6,850 | 14,450 | | | 13,600 | | 7,000 |
| RBC | | 5,820,000 | | | | | |
| Hb* | 17.1 | 17.6 | | | 18.2 | | 13.7 |
| HCT** | 53 | | | | 58 | | 44 |
| Urine | sugar, negative; acetone, negarive; albumin, negative | | | specific gravity, 1.020; sugar, negative; acetone, negative; albumin, negative | | | |
| Case 5 | | | | | | | |
| WBC | 4,600 | | | | 29,000 | | |
| RBC | 7,250,000 | | | | | | |
| Hb* | 21.4 | | | | 16.7 | | |
| HCT** | 71 | | | | 54 | | |
| Urine | | | | | albumin, 2; sugar, trace; acetone, trace; 2-hyaline casts; 10-15 red blood cells; 5-10 white blood cells | | |

*Hemoglobin - grams per 100 ml
**Hematocrit - ml per 100 ml

mask to participate in a hypoxia demonstration. Almost immediately he noted difficulty in writing numbers, and his oxygen mask was replaced after 30 seconds. He remained at this altitude while one half of the group continued with the hypoxia demonstration. At this time he experienced mild pain in his right elbow. He insisted that this pain was not serious enough to cause his removal from the chamber. Several times the inside observer questioned him concerning the pain, but no progression was reported. It was noted that the subject's color and respirations were normal. He was alert and responsive, but as normal descent was about to begin he suddenly indicated an urgent desire to descend. He stated that the pain in his right elbow had not subsided and that he had developed an odd sensation requiring that he reach ground level as soon as possible. As descent started, the inside observer connected the patient to a portable oxygen bottle to permit him to be removed to the chamber lock, at which time the patient became unconscious and emergency descent was accomplished. The patient denies being unconscious and states that he remembers everything that was said and was well aware of his surroundings, but that he lost complete muscular control and could not move. The inside observer noted obvious ocular deviation during descent.

Upon reaching ground level, the patient was in a state of complete helplessness and was carried to the recovery room. The pain in the right elbow had disappeared upon recompression. Blood pressure taken immediately in the recovery room was recorded as 90/46 mm Hg; respirations, 28 per minute, pulse, 80 per minute, strong and regular, and remained stable. The officer's skin was pale, cold, and clammy. He, however, was alert mentally and in contact with his surroundings. Funduscopic examination revealed moderate pallor of the optic disks. Complete neurologic examination revealed a hyperactive patellar reflex on the right and a positive Oppenheimer on the left. The medial surface of the left leg was hyperesthetic to pinprick. Electrocardiographic tracings 20 minutes after removal from the chamber were within normal limits. The patient stated that while lying on the table in the recovery room he noticed that the yellow light in the ceiling seemed to be going around in circles for some 10 minutes. During this time he also noted that he had difficulty in focusing on any distant object. The object would come into focus and then gradually fade. Blood pressure recorded during the first 20 minutes in the recovery room was 100/62 mm Hg and then stabilized at 112/84 mm Hg.

The patient was then admitted to the hospital where oxygen was administered and 1,000 ml of 5 per cent dextrose in saline solution was started intravenously. He was given 15 mg of Wyamine Sulfate (brand of mephentermine sulfate) intramuscularly. He responded immediately with a sustained rise in blood pressure and marked clinical recovery from his state of shock. Four hours after admission the oxygen was discontinued and approximately 6 hours after admission intravenous fluids were terminated. The following morning he was asymptomatic and was allowed out of bed. Serial electrocardiograms and roentgenograms of the chest were normal. Complete neurologic examination

findings were within normal limits at this time, and he was discharged 72 hours after admission. Laboratory studies are summarized in table 1.

This patient had adequate sleep the night before and there was no history of fatty food intake prior to his chamber flight. No alcoholic beverages were ingested for 24 hours preceding the chamber flight. His weight was recorded as 191 pounds and his height as 71 ½ inches.

Follow-up examination in August 1958 revealed a well-developed man with a receding hairline. He appeared approximately 10 years older than his stated age of 38. He was moderately obese, weighing 171 pounds.

Physical and neuropsychiatric examination findings, including electroencephalographic tracings, were within normal limits, except that while he was breathing 7 per cent oxygen, his electroencephalogram showed a lower tolerance to hypoxia than that usually seen. Ancillary laboratory studies, including liver function tests, were within normal limits.

*Case 3.* This 37-year-old officer, with over 2,000 hours of flying time in conventional type aircraft, participated in a routine altitude chamber flight on 19 October 1956. Prior to his chamber flight he was noted to be apprehensive. He entered the chamber, was placed on 100 per cent oxygen, and without a period of denitrogenation at ground level, was decompressed at the rate of 2,000 to 3,000 feet per minute. At 34,000 feet, he became aware of a tingling sensation in the skin of his chest. The oxygen regulator was then placed on the safety setting. He was breathing rapidly and was told to slow his breathing rate. The chamber altitude was taken to 42,000 feet and then returned to 30,000. At 30,000 feet a hypoxia demonstration was performed, but the patient did not participate. At this time he was hyperventilating (35 respirations per minute). He appeared pale, was sweating profusely, and described the presence of double vision and a feeling of dizziness. He attributed his rapid breathing to a feeling of suffocation. He stated his senses were dull and although he could hear, he could not see, and was losing the ability to use his extremities. It was decided to evacuate him from the chamber. As he stood up, he showed definite signs of muscular in-co-ordination, manifested by short faltering steps. He was immediately brought to ground level, at which time it was noted that his rapid breathing had subsided. He was seen by the flight surgeon who recorded his blood pressure as 110/80 mm Hg and his pulse rate as 83. He was placed on a stretcher and taken to the hospital.

While being moved to the hospital he described a subjective feeling of falling off the left side of the stretcher. Shortly after reaching the hospital he developed nausea and violent vomiting, frontal and occipital headaches, and stiffness and soreness in the left side of his neck and his left shoulder. Examination revealed a well-developed, well-nourished man, 72 inches tall, weighing 170 pounds, who was not unconscious but responded sluggishly to questions and instructions

and appeared very weak. Physical and superficial neurologic examinations were essentially negative, except that there was some suggestion that when the patient was looking upward his right eye deviated slightly to the right. His semistuporous condition prevented a neurologic examination for cerebellar dysfunction. Initial laboratory work revealed a white blood cell count of 20,600 per $\mu$l, with 89 per cent neutrophils, 10 per cent lymphocytes, and 1 per cent monocytes. Hemoglobin was 14.4 grams per 100 ml; sedimentation rate was 9 mm per hour. Urinalysis was entirely negative, with a specific gravity of 1.028.

Following admission to the hospital the patient continued to complain of a severe headache which persisted for approximately 24 hours. He moaned and thrashed about in his bed, took fluids poorly, had slurred speech, and appeared very confused at times, although with sufficient probing, appropriate responses could be elicited. Four and one half hours after admission a lumbar puncture revealed clear spinal fluid at a pressure of 260 mm of water and normal fluid dynamics. Sixteen hours after admission to the hospital he was placed in an oxygen tent and 1,000 ml of 5 per cent dextrose in water was started intravenously. In 24 hours he appeared much more oriented, but would follow instructions in a sluggish manner. A complete neurologic examination at this time revealed dysdiadochokinesia of the left hand, in-co-ordination on the left finger-nose test, a tendency to fall to the left on walking, slurring of speech, and involuntary movement of the left wrist, best described as athetoid in character. He remained in an oxygen tent for approximately 36 hours, and received intravenous fluids consisting of 10 per cent dextrose in water.

By the morning of the fourth hospital day the patient was sufficiently improved to get out of bed and walk around. He was fully oriented and complained only of pain at the back of his neck. The patient continued to improve and was discharged from the hospital on the sixth day following his chamber reaction. Neurologic examination at the time of discharge revealed marked improvement in co-ordination of the left hand; however, there was still evidence of some in-co-ordination of the finger-to-thumb test. The slurring of speech which was noted on admission was relatively unchanged.

An electrocardiogram 12 hours after admission revealed T waves to be low in all standard leads and unipolar limb leads. Diasphasic T waves were noted throughout the chest leads. An electrocardiogram four days later revealed the T waves to be upright, and the tracing was considered entirely within normal limits.

One month later this patient was evaluated at this school. Electroencephalograms and roentgenograms of the skull were negative. Neurologic examination revealed decreased co-ordinated movement of the right arm, dysdiadochokinesia, mild spasticity, and weak rebound phenomenon in the left arm, and instability while standing on the left foot with eyes closed.

The dysmetria in the left finger-nose test was not sufficiently great to be considered abnormal, and there was no evidence of slurred speech

at this time. Ancillary laboratory studies were unremarkable except for a leukocyte count of 22,500 per $\mu$l, with a normal differential. An electrocardiogram was within normal limits. Ear, nose, and throat examination, including vestibular function, revealed no abnormalities. An ophthalmological examination findings were within normal limits except for a borderline color vision deficiency. Clinical psychologic and medical status examination revealed no evidence of impaired functioning on an organic basis. Five months after the original episode this patient was re-evaluated at this school. A repeat neurologic evaluation was entirely within normal limits with complete disappearance of previously abnormal findings. Ancillary laboratory studies revealed a persistent leukocytosis. Bone marrow differential revealed normal distribution of cells belonging to the granulocytic and erythrocytic series. The patient's elevated white blood cell count was thought to represent an idiopathic leukocytosis.

*Case 4.* This 35-year-old senior pilot has 3,290 hours of military flying time in conventional type aircraft and 10 hours in the T-33. He was participating in a towing mission in the back seat of a T-33 on 20 March 1958. About 25 minutes after take-off, an altitude of 35,000 feet was reached (the cabin altitude was 26,000 feet). At this time the patient began to experience pain in the right lower costal area. He thought that this probably was due to "gas" and made no mention of it. The plane continued to climb to 37,000 feet, where the mission was to be accomplished. He then noticed pain in the left anterior axillary fold and above the left knee and the right elbow. This pain was not in the joints. At this point the patient began to experience tingling in the arms and hands. He thought he might be hypoxic and switched to 100 per cent oxygen. He then took a deep breath and within a few seconds developed a severe, dry, hacking cough. The pilot, having been notified of the patient's difficulty, descended to 30,000 feet. The respiratory difficulty subsided, although the pain in the various areas persisted. Further descent to 13,000 feet was accomplished with relief of all symptoms. Altogether the patient estimates that they were at 37,000 feet for 15 to 20 minutes, 30,000 feet for 10 to 15 minutes, and 13,000 feet for another 15 minutes. After landing he noted that he felt unusually tired and there was some residual soreness in the areas where the pain had been. He was not hospitalized and no laboratory studies were performed.

The following morning, at approximately 1100 hours, the patient noted nonpruritic, hive-like, red splotches in the same areas where he had previously experienced pain. The splotches started to disappear in the afternoon and by the next day were entirely gone.

This officer had made only five previous jet flights and these flights were not over 30,000 feet. He only has been in the altitude chamber twice during his flying career: the first, during cadet training in 1941, and the second, one and one half years ago during which he experienced pain in his left shoulder joint at 33,000 feet.

A review of this patient's dietary and sleep habits prior to his T-33 flight revealed no significant features. His lunch consisted of a ham-

burger and pie ala mode. There is no history of alcohol intake in the preceding 24 hours.

Complete neuropsychiatric examination, including roentgenograms of the skull and an electroencephalogram, was within normal limits. Physical examination revealed a well-developed man with a receding hairline and appearing 10 to 15 years older than his stated age of 35. He was moderately obese and flabby. He was 71 ½ inches tall and weighed 183 1/4 pounds. The rest of the physical examination findings were entirely negative except for a marked dermographia. Laboratory studies, including liver function tests, were within normal limits except for a moderate elevation of the serum cholesterol, serum phospholipids, and serum lipid protein fractions as follows: cholesterol total, 334 mg per 100 ml. $S_f$ 0-12 class: 412; $S_f$ 12-20 class: 96; $S_f$ 20-400 class: 420. Atherogenic index (AI) is 132. Cholesterol, 364 mg per 100 ml. Phospholipids, 13.9 mg per 100 ml.

*Case 5.* This 46-year-old civilian flew as a passenger in the rear seat of a T-33 jet aircraft on 29 April 1956. He previously had participated in an altitude chamber indoctrination in February 1956. Prior to take-off he was briefed on the use of the oxygen equipment. He had eaten a normal breakfast, but had omitted his noon meal. The oxygen regulator was set on "normal" and take-off was accomplished at 1530 hours. An altitude of 40,000 feet (cabin altitude, 31,000 feet) was reached in 30 minutes and the aircraft assumed level flight. The pilot checked his passenger by questioning him over the intercom about every 5 minutes and received normal replies. About one hour after take-off the passenger stated that he did not feel well and complained of a dull aching pain in his left knee. About 15 minutes later there was tingling and numbness in his fingers. The pilot instructed him to switch to 100 per cent oxygen. The passenger acknowledged this instruction but when asked if he had switched, he said, "No." He was firmly instructed several times to switch to 100 per cent oxygen but each time when asked if he had switched he would say "no." The patient remembers this episode and states that he had an "I don't care feeling."

In view of the passenger's peculiar behavior, the pilot decided to descend to 20,000 feet (cabin altitude, 13,000 feet), and when a lower level was reached, the passenger switched the setting on the oxygen regulator to 100 per cent oxygen and 41,000 feet. He switched to the positive pressure setting because he thought he was having difficulty breathing and that it was easier with the positive pressure. The passenger then said he felt all right and it was decided to continue the trip. The aircraft ascended to 40,000 feet and the passenger experienced no further symptoms except that he felt anxious during the remainder of the flight. After landing at 1655 hours the passenger complained that he felt quite fatigued and had difficulty buttoning his shirt. He then accompanied the pilot to the pilot's home where he complained of feeling weak and faint. He felt better after lying down, but vomited liquids which were given to him. He was then transported to the hospital where he fainted twice in the admitting room but quickly regained consciousness after each episode of fainting.

Initial examination, 6 hours after landing, revealed a pale, stocky, well-nourished, well-developed man, weighing 183 pounds and measuring 67 inches in height. He was alert, well oriented, co-operative, and said that he felt better in a supine position. His pulse was 108; blood pressure, 102/88 mm Hg; rectal temperature, 100.2 F; respirations, 18 per minute, slow and deep. Positive findings on physical examination were a cool, moist skin, low blood pressure, and distant heart sounds. Careful neurologic examination findings and eye grounds were normal. The patient was immediately placed in an oxygen tent and was slowly given 2,000 ml of dextrose in distilled water. Laboratory studies are summarized in table 1.

Electrocardiographic findings were normal except for sinus tachycardia of 125. Approximately three hours following admission the patient went into complete circulatory collapse. His pulse was rapid, weak, and thready, and systolic blood pressure was 50 to 80. He was nauseated and vomited on several occasions. Eight milliliters of Levophed (brand of l-norepinephrine) was instilled in the infusion because the blood pressure became unobtainable. During the first 24 hours the patient received a total of 4,690 ml of fluid including 500 ml of dextran. During this time 45 ml of urine was excreted and 720 ml of blood-stained vomitus was regurgitated. The patient also was perspiring profusely. A lumbar puncture revealed normal fluid dynamics with an opening pressure of 140 mm of water. Neurologic examination findings at this time were within normal limits. The blood pressure gradually returned to normal (110/76 mm Hg), and the patient improved markedly. During the second 24 hours, the hematocrit fell to 54 ml per 100 ml, hemoglobin was 16.7 grams per 100 ml, and the white blood cell count was 29,050 per $\mu$l. He received a total of 5,000 ml of fluid by mouth and vein during the second day and was placed on prophylactic penicillin and streptomycin sulfate. Urinary output increased after recovery from shock and hemoconcentration and urinary output was over 5,000 ml the second day. The patient continued to improve and by the third day he had recovered entirely, except for a corrected erythrocyte sedimentation rate of 25 mm per hour.

Urinalysis, (catheterized specimen) 18 hours after admission, showed 2+ albumin, trace of sugar, positive acetone, 2 hyaline casts, 10 to 15 red blood cells and 5 to 10 white blood cells per high powered field. Blood chemistry studies in the first 24 hours revealed urea nitrogen, 30.5 mg per 100 ml; carbon dioxide, 47 volumes per cent; serum sodium, 137 mEq per liter; and potassium, 4.5 mEq per liter.

Serial electrocardiographic tracings revealed some change in the T waves of the chest leads from an initial low positive to diphasic and then to inverted T waves. S-T segments became elevated in leads I, II, III, aVF and depressed in aVR. These ECG changes gradually returned to normal within 7 days.

This patient has not been exposed to an altitude of over 20,000 feet since his original episode. Two years and 4 months later a follow-up examination, which included a complete physical examination, neurologic examination, electroencephalogram, electrocardiogram, and visual

TABLE 2. *Summary of the findings in five cases of dysbarism*

TABLE 2. *Summary of the findings in five cases of dysbarism*

| Case | Age | Follow-up interval | Type of incident | Reaction classification | Altitude (feet) | Time at altitude | Ht. | Wt. | Significant findings | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Initial episode | Follow-up |
| 1 | 33 | 4 years | Chamber | Neuro-circulatory | 43 | 5 min. | 72" | 195 | Gas pain, dizziness, loss of consciousness, blurred vision, paresthesias, shock, right hemiparesis, tracheotomy | Moderate obesity. Appeared older than age. |
| 2 | (a) 23 | (a) 15 years | Chamber | (a) & (b) Neuro-circulatory | (a) 38 | (a) 45 min. | 69" | 170 | (a) Paresthesias, unconsciousness, right hemiparesis (b) Bends, unconsciousness, shock, visual and reflex changes | Appears 10 years older than age. Obese. Decreased hypoxia tolerance shown on EEG. |
| | (b) 37 | (b) 1 month | Chamber | | (b) 43<br>30 | (b) 21 min. | 69" | 185 | | |
| 3 | 37 | (a) 1 month<br>(b) 5 months | Chamber | Neuro-logical | 42<br>30 | 12 min. | 72" | 170 | Semiconsciousness, vertigo, slurred speech, dysdiadochokinesia, positive Romberg, involuntary movements of left hand, abnormal ECG | (a) Decreased co-ordination movement, right arm. Dysdiadochokinesia, left arm. Instability standing on left foot. (b) Normal. |
| 4 | 35 | 2 months | Inflight | Neuro-circulatory | 29 | 20 min. | 71½" | 183 | Bends, chokes, fatigue, skin reaction-delayed | Moderate obesity. Appears older than age. Elevated serum lipids. Dermographia. |
| 5 | 46 | 2 years<br>4 months | Inflight | Circulatory | 31 | 30 min. | 67" | 183 | Vomiting, loss of consciousness, shock, abnormal ECG | Obese. |

fields, was within normal limits. There was no evidence of any residua following this severe episode of dysbarism.

## DISCUSSION

The significant details of these cases are summarized in table 2. The altitude given is the peak altitude attained. In the case of inflight incidents, the altitude is cabin altitude as contrasted to ambient altitude. When the reaction occurred at an altitude lower than the peak altitude reached, the peak altitude is followed by the altitude at which the reaction occurred.

With the exception of the initial reaction of patient 2 and patient 5, all cases occurred when the patients were in their thirties. An increased incidence with age has been reported by many authors. This has been shown to be significant in even as small an age band as 18-28 years.[5]

The follow-up interval varies from 1 month to 15 years. Surveys of the literature reveal a remarkable lack of follow-up information on dysbarism cases. The cases reported here represent the initial effort in a continuing program of follow-up studies.

Three of these incidents occurred in altitude chambers, and two in aircraft. Both in-flight cases occurred in T-33 aircraft. Difficulty in maintaining cabin pressurization below 25,000 feet in such aircraft has been previously reported as resulting in dysbarism production.[1]

As previously reported[1] there have been several attempts to classify severe dysbarism reactions. Three of these patients exhibited both neurologic and circulatory findings, one was principally neurologic and another circulatory.

The altitude at which the reactions occurred varied from 29,000 to 43,000 feet. In two instances, reactions occurred at 30,000 after the reactors had been to a peak altitude of 43,000 feet. Severe dysbarism resulting in death has been noted at cabin altitudes as low as 22,000 feet,[6] and a severe case with recovery was reported after exposure to a cabin altitude of 24,000 feet.[7]

In this and previous reports we have noted the time of exposure to altitudes in excess of 30,000 feet. In view of the above reports, perhaps the time over 20,000 feet should be noted. The exposure times in these cases ranged from 5 to 30 minutes over 30,000 feet prior to onset of difficulty. The time of exposure does not have to be prolonged; 90 to 97 per cent of a large group of chamber reactors had been over 30,000 feet for 20 minutes or less before developing dysbarism.[1]

The patients reported in this article confirm a generally held opinion concerning the relationship of obesity and dysbarism. All but patient 3 were moderately obese at the time of the dysbarism incident and also at the time of the follow-up examination. In comparing the weights with those given in the weight

table used by the Air Force it was noted that all were less than their maximum allowable weight but were considered obese by the examining physicians. A comparison of standard weight plus 10 per cent and weight at time of reaction shows patients 1, 2, 4, and 5 to be 5 to 16 pounds above this more realistic maximum weight.

Hemoconcentration to a marked degree was noted in three of the five patients reported (table 1). It is of interest that even after intravenous fluids, hemoconcentration continued to occur. Although the exact mechanism causing shock during or after exposure to decreased barometric pressure is undetermined, it is believed that the hemoconcentration which occurs is secondary to shock. The leukocytosis noted can probably be best explained as a reaction to stress and shock and is not explainable by hemoconcentration alone.

Of special interest is case 5 where initial blood studies made six hours after exposure to altitude revealed a hematocrit of 71 ml per 100 ml. Fluids totaling 4,690 ml (including 500 ml of dextran) were administrated, and 24 hours later the hematocrit was 54 ml per 100 ml.

Treatment of dysbarism has always been symptomatic and early adminstration of intravenous fluids has been recommended. Four of the five patients received fluids in varying amounts. The same four also were given oxygen and one patient was given prophylactic penicillin and streptomycin sulfate. In one instance 15 mg of Wyamine and in another 8 ml of Levophed were used effectively to elevate low or unobtainable blood pressure. While vasoconstrictors are of value in elevating blood pressure, difficulty may be encountered in maintaining the blood pressure after their discontinuance. Vasospasm seems to play a significant role in the mechanism of dysbarism and drugs which will enhance this should be used cautiously. We believe the use of 5 per cent carbon dioxide as a potent cerebral vasodilator has not been fully exploited in these cases.

The thorough follow-up examinations were quite remarkable for their uniformity of negative findings. An interesting observation on this small sample was the presence of a personality and body type in four of the five cases. These patients tended to be soft spoken, mild mannered, and retiring, to appear older than their stated ages (manifested by receding hairlines in some), and to have remained moderately obese. We were quite amazed at the similarity in appearance of these patients.

Inasmuch as fat emboli and fatty livers have been noted in most fatal cases and are thought to play a role in the cause of neurocirculatory collapse, we have been interested in liver function and lipid studies. Unfortunately we did not obtain these studies in all cases nor have we performed liver biopsies. In

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one instance, case 4, where lipid studies were done, we found an elevation. The significance of this finding is unknown. Lipid studies in case 2 were normal.

In an earlier report[3] it was hypothesized that there would be some neurologic residua noted if a large group of severe dysbarism cases were studied at intervals after the dysbarism episode. This larger study is underway, but in the cases presently being reported only one patient (case 3) exhibited measurable residua. On examination one month after the original dysbarism incident he had dysdiadochokinesia of the left arm, decreased co-ordinated movement of the right arm, and instability when standing on the left foot. These residua had cleared, however, some five months after the incident. To our knowledge this leaves only the case with visual field defects, reported by Mebane,[8] and von Döbeln and Höök's[9] case with paraplegia having "permanent" or long-term dysbarism residua. Höök[10] recently reported marked improvement in his patient after a three-year follow-up examination revealed spasticity and weakness in both legs, staggering gait, and bilateral positive Babinski. The patient had been returned to flying as a copilot. Further follow-up study of these cases is needed to determine the incidence of residua, and more definitive tests for obscure residual effects would be most desirable.

The question of susceptibility to dysbarism is an intriguing one. During World War II numerous studies were made to attempt to pick the individuals most susceptible to decompression sickness. It appears to be the concensus that selection offers little hope of eliminating this problem for there are too many factors altering susceptibility. Roxburgh[11] stated, "Decompression sickness is a condition to be expected in normal men and occurs without any predisposing pathology. It is probable, however, that the great majority would be affected should the exposure be sufficiently severe." We must attempt to answer the question as to whether an individual who has had one episode of severe dysbarism is more susceptible than one who has had none. If the answer is no, then we can look upon these episodes as accidents and figure the calculated risk. If the answer is yes, then steps should be taken to prevent the exposure of these individuals to altitudes in excess of 20,000 feet. Though cabin pressurization is commonplace, it still is not 100 per cent reliable as a means of protection. Denitrogenation prior to exposure has been shown to be of definite value in protection. In order to answer our question posed above we would have to re-expose a large group of persons who have had severe dysbarism to altitude, preferably in the low-pressure chamber. Would one such exposure with negative results be enough to convince the flight surgeon that the patient was no more susceptible than one not having had a dysbarism reaction? We think not. Case 2 is a good example. This pilot had his initial severe dysbarism episode 15 years ago. In the interim

he has been exposed to altitudes in excess of 20,000 feet in the chamber on five occasions and in actual flight for approximately 12 hours. None of these exposures resulted in dysbarism symptoms, still he recently again had a severe reaction. Is this chance or is he more susceptible? Romano and associates[12] demonstrated increased susceptibility. We need to evaluate seriously the risk of re-exposing one-time reactors to altitude, for we must have the courage to do so if we are to obtain a definite answer.

This brings us to the disposition of such cases. These flying personnel were referred to us for recommendations as to disposition. It is our opinion that such disposition must be based on the answers to two questions: (1) Are there any residua of the episode? (2) Is the person more susceptible to dysbarism than other pilots? The first question can usually be satisfactorily answered by thorough examination. The second depends upon re-exposure, and thus has not been satisfactorily answered to date. In the absence of this information we can only recommend that such cases be advised to remain below altitudes of 20,000 feet.

## SUMMARY

Dysbarism is a constant potential hazard in all high altitude flight. It may have severe manifestations at altitudes as low as 22,000 feet. Follow-up examinations have been conducted on three low-pressure chamber and two in-flight dysbarism cases. The pertinent details of the original episodes and the follow-up examinations are reported. The follow-up interval varies from 1 month to 15 years. All but one of the patients were moderately obese at the time of the reaction and at follow-up. The question of residua, susceptibility, and disposition were discussed.

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# THE FREE ACHILLES REFLEX AS AN AID IN THE DIAGNOSIS OF THYROID DYSFUNCTION

JOHN D. LAWSON, *Major, MC, USA*

SINCE my earlier report on the use of the free Achilles reflex as an aid in the diagnosis of thyroid dysfunction,[1] the original work has been extended to over three thousand patients. It is my purpose in this communication to report on the results of this further experience.

Insofar as the Achilles reflex is concerned I shall only consider the interval from the initiating stimulus to the end of contraction, the S-D interval, shown in figure 1.

## METHODS AND MATERIALS

The basic inductance apparatus, the kinemometer, was described in a previous publication.[1] In addition to the comments made at that time there are several points that should be elaborated on. It should be noted that the complex diphasic curve registered by the apparatus that we use is a speed-time curve, which is not particularly related to the amplitude of the movement recorded. To this degree it is like a velocity ballistocardiogram. However, due to the geometric configuration of the cores, the inductance balance, and the winding of the coils relative to the configuration of the magnet, it is designed to minimize vertical and horizontal movement registration relative to the movement of the heel during the reflex recording.

Three thousand and seventy-two patients have now been studied. Of these 2,996 were euthyroid, 34 were hypothyroid, and 42 were hyperthyroid. In no case was the diagnosis made by me. All of the patients were referred for Achilles testing after the diagnosis had been determined by conventional means, and the referring physician did not reveal the diagnosis until the testing had been completed and the results tabulated as to the S-D values. No patient was considered as abnormal by the referring physician unless there were at least two confirmatory tests of thyroid dysfunction, including a serum protein-bound iodine (PBI),

From Brooke Army Hospital, Brooke Army Medical Center, Fort Sam Houston, Tex.

radioactive iodine ($I^{131}$) uptake or conversion ratio, and basal metabolic rate.

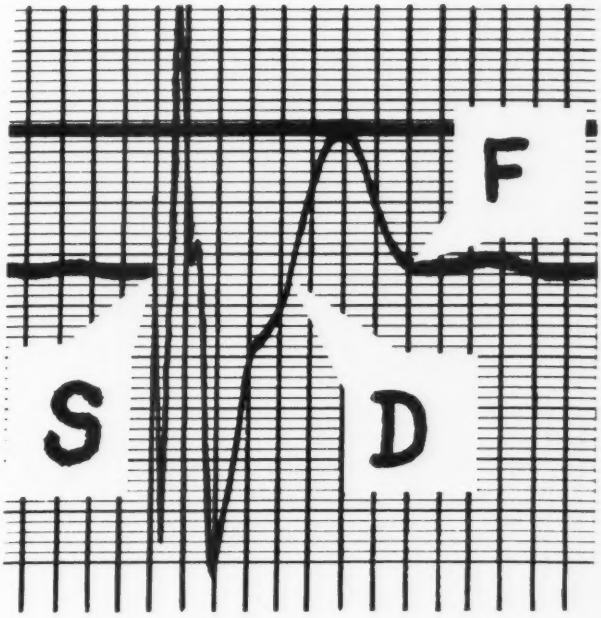


*Figure 1. A typical Achilles reflex tracing showing: S, the point of initial stimulus; D, the end of muscular contraction; F, the end of muscular relaxation.*

## RESULTS

Typical hyperthyroid tracings are shown in figure 2. Typical hypothyroid tracings are shown in figure 3.

The statistical parameters obtained for the euthyroid patients were: S-D mean, 189.36 milliseconds; standard deviation, 22.60 milliseconds. The distribution of the euthyroid patients was somewhat platykurtic but normally distributed, and when tested by the chi-square goodness of fit criteria[2] more sampling variation than seen in this series would have been encountered 60 percent of the time, assuming a normal distribution in the population tested.

The statistical parameters for the 34 hypothyroid patients were: S-D mean, 259.83 milliseconds; standard deviation, 12.49 milliseconds. The values were compatible with a normal distribution. However, due to the sample size, a firm statement cannot be made on this point at this time.

In the 42 hyperthyroid patients the S-D mean was 136.32 milliseconds; standard deviation, 14.90 milliseconds. These values were somewhat skewed to the left.

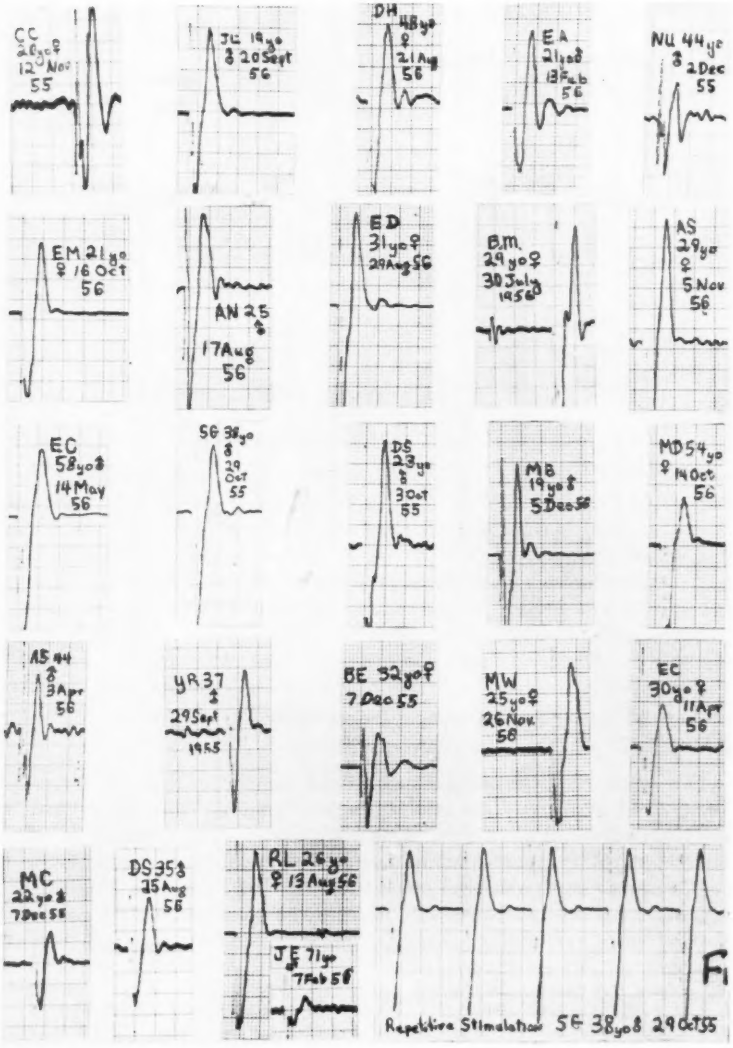
CC 26yo♀ 12 Nov 55
JC 19yo ♂ 20 Sept 56
DH 48yo ♀ 21 Aug 56
EA 21yo♂ 13 Feb 56
NU 44yo ♂ 2 Dec 55
EM 21yo ♀ 16 Oct 56
AN 25 ♀ 17 Aug 56
ED 31yo♀ 29 Aug 56
BM 29yo♀ 30 July 1956
AS 29yo ♀ 5 Nov 56
EC 58yo♂ 14 May 56
SG 38yo ♂ 29 Oct 55
DS 23yo ♀ 30 Oct 55
MB 19yo♀ 5 Dec 56
MD 54yo ♀ 14 Oct 56
AS 44 ♂ 3 Apr 56
YR 37 ♂ 29 Sept 1955
BE 32yo♀ 7 Dec 55
MW 25yo♀ 26 Nov 56
EC 30yo♀ 11 Apr 56
MC 22yo♂ 7 Dec 56
DS 35♂ 25 Aug 56
RL 26yo ♀ 13 Aug 56
JE 71yo ♂ 7 Feb 56
Repetitive Stimulation 56 38yo♂ 29 Oct 55

*Figure 2. Typical hyperthyroid tracings.*

It also was found that in comparing the two legs, there was an identity of response in all but 0.5 percent of the patients. In 0.4 percent of the patients, no Achilles reflex could be obtained.

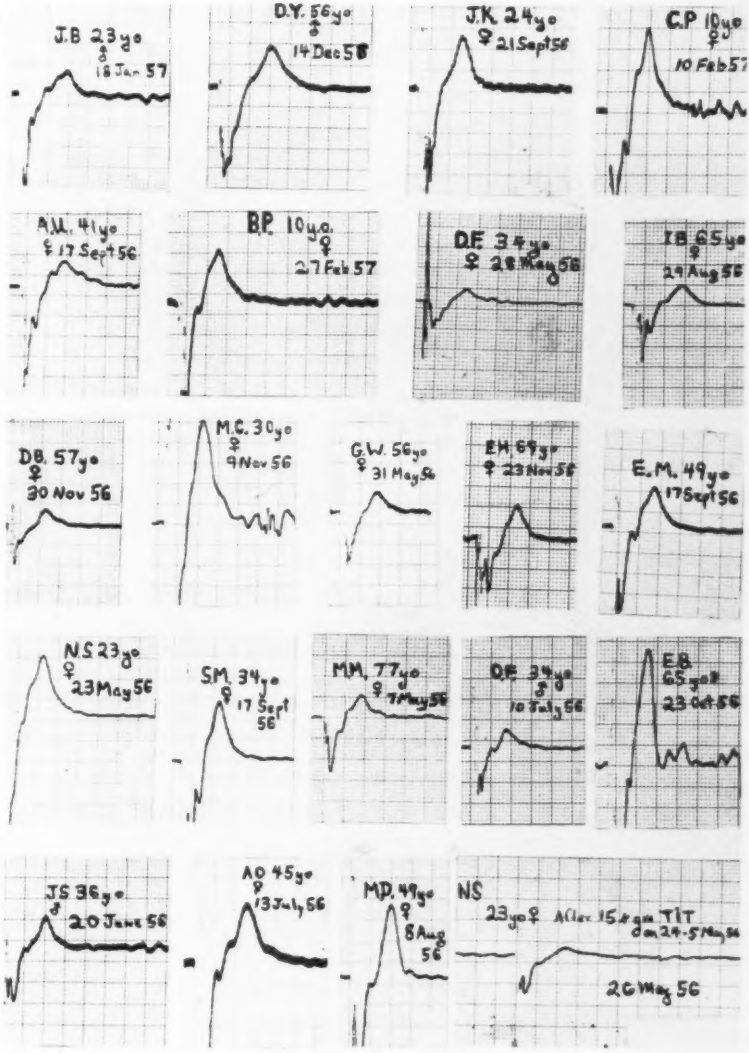
J.B 23yo ♂ 18 Jan 57
D.Y. 56yo ♀ 14 Dec 56
J.K. 24yo ♀ 21 Sept 56
C.P 10yo ♀ 10 Feb 57
A.M. 41yo ♀ 17 Sept 56
B.P. 10yo.o ♀ 27 Feb 57
D.E. 34yo ♀ 28 May 56 ♂
I.B 65yo ♀ 29 Aug 56
D.B. 57yo ♀ 30 Nov 56
M.C. 30yo ♀ 9 Nov 56
G.W. 56yo ♀ 31 May 56
E.H. 69yo ♀ 23 Nov 56
E.M. 49yo ♀ 17 Sept 56
N.S 23yo ♀ 23 May 56
S.M. 34yo ♀ 17 Sept 56
M.M. 77yo ♀ 7 May 56
D.E. 34yo ♂ 10 July 56
E.B. 65yo ♀ 23 Oct 56
J.S 36yo ♂ 20 June 56
A.O 45yo ♀ 13 July 56
M.P. 49yo ♀ 8 Aug 56
N.S 23yo ♀ 20 May 56

*Figure 3. Typical hypothyroid tracings.*

In all but two of the patients tested in whom no Achilles reflex could be obtained, a satisfactory reflex was obtained using the patellar reflex with the magnet placed on the body of the quadriceps femoris muscle. The intervals obtained by this method are the same as with the Achilles reflex. Two of the patients demonstrated no deep tendon reflexes.

TABLE I. *Comparision of various diagnostic tests for thyroidism in 3,072 patients*

| Test | Number of patients | Percent hypo by test | Percent hyper by test | Percent normal by test |
|---|---|---|---|---|
| Euthyroidism Diagnosis | | | | |
| Achilles | 2996 | 2.8 | 1.2 | 95.9 |
| PBI | 301 | 1.1 | 9.6 | 89.3 |
| $I_{131}$ uptake | 75 | 7.3 | 4.5 | 88.2 |
| $I_{131}$ conv. ratio | 75 | 13.7 | 4.5 | 81.8 |
| Cholesterol | 253 | 7.2 | 5.2 | 87.6 |
| BMR | 261 | 16.3 | 17.3 | 66.4 |
| Hypothyroidism | | | | |
| Achilles | 34 | 94.1 | -- | 5.9 |
| PBI | 34 | 94.1 | -- | 5.9 |
| $I_{131}$ uptake | 30 | 76.7 | -- | 23.3 |
| $I_{131}$ conv. ratio | 30 | 66.7 | -- | 33.3 |
| Cholesterol | 28 | 21.4 | -- | 78.6 |
| BMR | 34 | 64.8 | -- | 35.2 |
| Hyperthyroidism | | | | |
| Achilles | 42 | -- | 71.4 | 28.6 |
| PBI | 39 | -- | 87.6 | 12.4 |
| $I_{131}$ uptake | 38 | -- | 95.0 | 5.0 |
| $I_{131}$ conv. ratio | 38 | -- | 92.2 | 7.8 |
| Cholesterol | 40 | -- | 25.0 | 75.0 |
| BMR | 40 | -- | 90.0 | 10.0 |

Normal Values, Brooke Army Hospital

Achilles S-D interval ..... 140–240 milliseconds
BMR ..... plus or minus 10
Cholesterol ..... 160–340 mg per 100 ml
$I_{131}$ uptake ..... 7–40 percent of injected dose
PBI ..... 4.5–8.5 micrograms per 100 ml
$I_{131}$ conversion ratio (PBI) ..... 8–79 percent

The 48-hour radioactive iodine tests were used in this study because they correlated better with the patient's final clinical status than the 24-hour tests which were also done.

In studying the variation of the Achilles reflex, two procedures were carried out. In the first procedure, a group of 10 euthyroid patients had weekly reflex tests for a period of four months. During this observation period the maximum variation of the S-D interval was 16 milliseconds over-all. In the second procedure, 20 reflexes were obtained on both legs in a group of 100 patients,

and the maximum variation observed. The maximum variation in reflexes under these circumstances was 20 milliseconds. It should be noted, however, that the usual variation was about 8 milliseconds and that in all the records 75 percent of the reflexes were within a span of 8 milliseconds. This degree of reproducibility is well within the tolerances required clinically.

The over-all diagnostic accuracy of the tests used in this series is presented in table 1.

## DISCUSSION

In our hands the Achilles reflex test has proved to be a valuable adjunct in the diagnosis of thyroid dysfunction. It is not intended as a test of thyroid function per se, inasmuch as we consider that we are measuring an end organ response. To this degree it might be considered as comparable to the basal metabolic rate and cholesterol determinations.

The test should not be used as the final determinant in treatment, but rather in conjunction with the other more commonly used tests of thyroid function. The Achilles reflex test can be used as a simple office procedure with a minimum expenditure of time. It can be used as a screening test and perhaps thereby obviate the need for more expensive and time-consuming tests. In conjunction with other tests it has proved of value in resolving conflicting laboratory data.

## SUMMARY AND CONCLUSIONS

A summary of our results in using the free Achilles reflex in the diagnosis of thyroid dysfunction has been presented. This study was conducted over a period of three years on 3,072 patients. In this series the Achilles reflex test was 95.9 percent accurate in diagnosing euthyroidism, 94.1 percent accurate in diagnosing hypothyroidism, and 71.4 percent accurate in diagnosing hyperthyroidism. These results compare favorably with the other more commonly used tests of thyroid dysfunction. The procedure is simple enough to be used in office practice as a routine procedure.

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# FRACTURES OF THE HUMERUS FROM MUSCULAR VIOLENCE

ELMER L. BINGHAM, *Lieutenant, MC, USN*

FRACTURES of the long bones due to muscular violence have long been included in standard textbooks dealing with fractures.[1] Review of the English literature to date reveals 10 instances of reported fractures of the humerus due to muscle violence.[2-5] These included one instance of a recurrence in the same humerus after eleven months.[5] This apparent void in the literature is probably more apparent than real, and the fractures not so uncommon as one is lead to believe. The following illustrative cases, in which no underlying structural weakness was demonstrable, occurred within the same year.

## CASE REPORTS

**Case 1.** A 21-year-old airman, was actively engaged in pitching a baseball. At the height of the throw the patient's arm gave way with a loud crack and fell loosely to his side. Roentgenographic examination revealed a comminuted fracture through the midshaft of the right humerus, with a large butterfly fragment involving the lateral aspect (fig. 1A). Treatment consisted of a hanging arm cast for six weeks, at which time there was firm clinical union (fig. 1, B and C). The patient was subsequently returned to full duty.

**Case 2.** A 20-year-old enlisted man sustained a fracture of the right humerus while pitching a baseball in an intramural sports contest. The fracture occurred at the peak of delivery, with an audible crack heard in center field. Roentgenographic examination revealed a comminuted fracture at the junction of the middle and distal thirds, with a large anterolateral butterfly fragment (fig. 2, A and B). The patient was treated with a hanging arm cast and returned to duty under treatment after four weeks. Follow-up x-rays at fourteen weeks showed satisfactory healing of the fracture (fig. 2, C, D, and E).

**Case 3.** A 26-year-old enlisted man sustained an injury to the right upper arm while throwing a softball. During delivery of the throw from center field the patient heard a crack when the arm was directly overhead. The ball was well directed and reached second base. There was immediate pain and weakness in the upper extremity. Roentgenograms revealed an oblique, comminuted fracture in the distal one third of the right humerus (fig. 3, A and B). The patient was treated with a hanging arm cast and returned to duty under treatment after four weeks.

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From U. S. Naval Hospital, Oakland, Calif.

Follow-up examination and roentgenographic studies out of his cast six weeks post injury revealed early union of the fracture with satisfactory position and alinement (fig. 3, C and D).

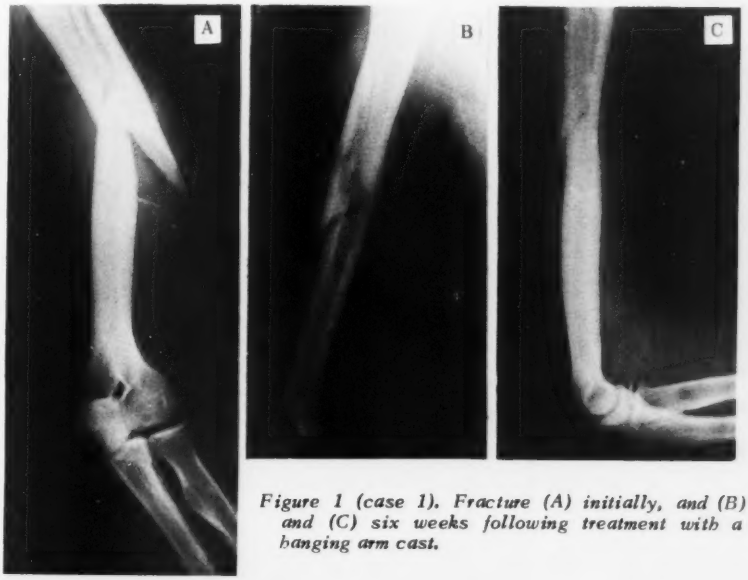


*Figure 1 (case 1). Fracture (A) initially, and (B) and (C) six weeks following treatment with a hanging arm cast.*

*Figure 2 (case 2). The initial fracture (A) and (B), and at follow-up 14 weeks after treatment (C), (D), and (E) with a hanging arm cast for 10 weeks.*

**Case 4.** A 24-year-old man was engaged in throwing a baseball in the late afternoon on a weekend. In the course of the ball delivery,

the upper right arm audibly cracked and fell limply to his side. Roentgenographic examination revealed a short oblique fracture of the lower third of the right humerus (fig. 4, A and B). An open reduction was

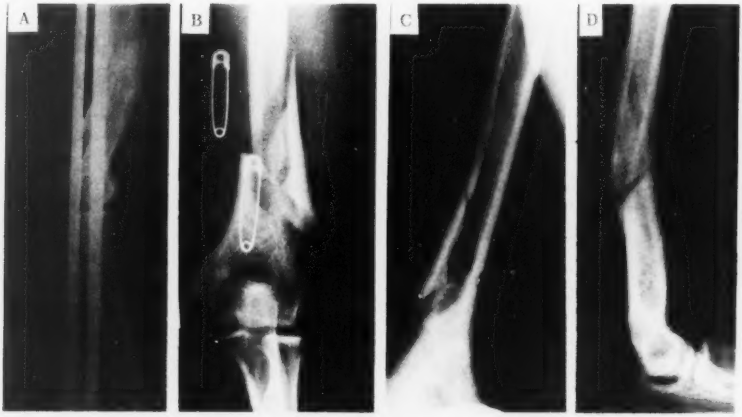


*Figure 3 (case 3). The initial fracture (A) and (B), and at follow-up (C) and (D) at six weeks following treatment with a hanging arm cast.*

*Figure 4 (case 4). Roentgenograms showing the initial fracture (A) and (B), and at final follow-up (Ç), (D), and (E) seven months after open reduction and internal fixation. (Case and roentgenograms courtesy of Dr. Douglas D. Toffelmier, Oakland, Calif.).*

performed, and the fracture reduced and fixed with two screws in an anatomic position. Long arm cast immobilization was maintained through the seventh week. Follow-up examination and roentgenograms taken after seven months revealed the complete healing of the fracture (fig 4, C, D, and E). The fracture site, examined at surgery, exhibited no abnormalities of the bone.

## DISCUSSION

These fractures of severe muscular violence occurred in healthy young men, none of whom were athletically conditioned. In none was there clinical or roentgenographic evidence of underlying bone disease.

The muscles of the upper arm—primarily deltoid, supraspinatus, infraspinatus, and terres minor—hold the head of the humerus in a relatively fixed position of external rotation. The flexors attached to the lower humeral shaft—primarily coracobrachialis, biceps, and brachialis—aided by the leverage of the bent forearm, are twisted into internal rotation, producing a powerful torsion on the shaft of the humerus. This mechanical effect of the long forearm lever, coupled with the powerful muscle pull, places a force on the fulcrum of fracture beyond the breaking point of the humerus.

It would seem that in these individuals the degree of coordination and conditioning was such that the abductors and external rotators did not have sufficient time to relax before the rapidly contracting flexors and internal rotators produced sufficient strain on the lower humeral shafts to produce quite similar fractures.

## SUMMARY

Four cases of fracture of the humerus sustained by ball throwing have been presented. The probable mechanism of fracture has been considered. Such fractures due to muscle violence may well be anticipated when strenuous sports are engaged in without the conditioning usually accompanying organized athletics.

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# PAPULAR URTICARIA CAUSED BY RED ANTS

HOWARD S. YAFFEE, *Lieutenant, MC, USNR*

IN recent years most dermatologists have accepted the causative role of insects in papular urticaria. Shaffer, Spencer, and Blank,[1] named the flea as the offender in some cases. Flies, chiggers, mosquitos, and bedbugs, have all been incriminated.[2] Absent from most lists of causative agents is the red ant. This is a report of two cases in which the common red ant, *Monomorium pharaonis*,[3] is believed to be the offender.

## CASE REPORTS

**Case 1.** A 24-year-old, para 2, gravida 1 housewife was seen in her third month of pregnancy, complaining of a skin eruption which had bothered her from late May to the date of her visit in August. The lesions began as conical papules, became extremely pruritic, lasted for three days, and then subsided with a brownish discoloration persisting for about three weeks. Attacks occurred both day and night, and usually were characterized by multiple lesions—as many as 20 at a time. The patient believed these might be the result of eating chocolate, to which she had no known previous sensitivity.

On examination the patient exhibited the above-described urticarial lesions, some distributed in lines, predominantly on the outer aspect of the arms and thighs. There also was severe seborrhea oleosa of the scalp, mild seborrheic dermatitis of the chest and face, and moderate keratosis pilaris, all present for many years.

Questioning disclosed that itching seemed to occur most often when the patient was in her bedroom, which adjoined a porch. Once she had removed a towel from the bedroom floor, felt a sharp stinging, and on looking down saw countless tiny red ants, one of which was on her thigh. While still observing, she noted the onset of a typical urticarial papule with a central tiny punctum, typical of the skin lesions with which she was concerned. With the use of appropriate insecticides, both the ant population and the disease were eliminated.

**Case 2.** A seven-year-old girl was seen in the pediatric clinic of this hospital where she had been referred because of a "food allergy" which had not responded to elimination diets and hyposensitization tests given by an allergist. For about nine months she had been bothered by small hive-like lesions which appeared intermittently, were intensely pruritic, and which she scratched. Attacks would occur any time, day

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From U. S. Naval Hospital, Chelsea, Mass. Dr. Yaffee is now at 60 Brattle Street, Cambridge, Mass.

or night, and sometimes were preceded by a sharp stinging sensation. Lesions were located over the outer aspects of the child's arms and legs, with a few involving the lower trunk.

Each lesion consisted of a 5-mm to 1-cm urticarial, papular, conical-shaped, excoriated areas. The remainder of the physical examination findings were normal. Examination of a stool specimen disclosed *Enterobius vermicularis*. Blood study findings were normal.

The family had lived in the South until one year prior to their clinic visit. They believed that the child's eruption might have been related to their second home, to which they had moved about nine months previously. The family kept no pets, although the child played with a neighbor's cat. Administration of a vermifuge resulted in cure of the pinworm infestation. Elimination of the cat produced no change in the eruption, which continued unabated in spite of both measures.

The youngster frequently played in an area in her home where red ants were seen, and it was noted that lesions occurred subsequently. A search disclosed numerous red ants throughout the house. Rather than deal further with this vexing situation, the parents immediately changed their residence. The child's eruptions came to an abrupt halt and did not return.

## DISCUSSION

Despite a prolonged period in which atopy and food allergy were reported in the medical literature as being responsible for papular urticaria, it is interesting that Bateman[4] stated, in reference to this condition, "Its first appearance is in irregular inflamed wheals so closely resembling the spots excited by the bites of bugs or gnats as to almost deceive the observer."

Apparently a state of immunity must be reached before lesions are produced by the bite of the causative vector. Insects placed on the skin of a newborn infant fail to produce urticarial or delayed types of response. In the majority of cases, an adult bitten for the first time will show little evidence, except perhaps a small punctum. The papular stage then supervenes, and when contact with the offending insect is prolonged the usual reaction is the loss of the "delayed" papular response (such as seen in the tuberculin type of hypersensitivity papule noted 48 hours after inoculation) and the conversion to the "urticarial" or "immediate" type of reaction.

Although anaphylactoid reactions[5,6] to the bite or sting of ants, and even cases in which the sting proved fatal,[7] have been reported, the earliest report which I was able to find in which ants were incriminated as a cause of papular urticaria was by Chipman,[8] who cited Dr. H. E. Alderson of San Francisco. Dr. Alderson observed urticarial papules, in newcomers to Honolulu, which he thought were caused by fruit and fish "but also by the bite of the tiny ant." He stated, "The ant seems to perform the role which the flea plays here."

The red ants observed in case 1 were later identified as belonging to *Monomorium pharaonis,* a nearly cosmopolitan species of ant which is common in homes in the New England area. These insects are distantly related to the more recently famous fire ant, *Solenopsis saevissima,*[9] and interestingly do not secrete the primary irritant, formic acid. Their toxic principle is unknown. The reaction to the bite of these ants suggests an immunologic mechanism resembling the reaction described for fleas; however, there is no direct proof for this supposition, since skin testing was not carried out.

## SUMMARY

Two cases of papular urticaria are presented in which the offending agent was identified as *Monomorium pharaonis* in one (the common red ant) and probably responsible for the other.

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## PUBLIC ESTEEM OF SURGEONS

The esteem in which surgeons are held by the public has undeniably diminished in recent years despite remarkable advances in scientific achievement. This regrettable situation stems from a subtle deterioration in our traditional standards for professional conduct. Restoration of public confidence in the future lies largely in the hands of the men and women who are now receiving residency training. Therefore, while it is essential that these residents acquire sound surgical concepts and at least a reasonable degree of technical skill, it is equally important that greater attention be given to the attitudes and habits which they develop during their residencies and carry with them into practice.—John Paul North: The Compleat Surgeon (editorial). *Surgery, Gynecology & Obstetrics,* December 1958.

# GRAVITY-ACTIVATED SHUTTER FOR RADIOGRAPHY WITH X-RAY THERAPY MACHINES

HARRY L. BERMAN, *Colonel, MC, USA*
GERALD M. McDONNEL, *Lieutenant Colonel, MC, USA*

OCCASIONS may arise when radiation therapy machines are used for diagnostic radiography. This is true of both intermediate voltage and supervoltage machines, as has been described in several articles.[1-3]

In order to use radiation therapy machines most efficiently for radiographic purposes, exposures should be made when voltage and amperage are at maximum desired levels. Conventional diagnostic x-ray machines are constructed to permit this to be accomplished with great rapidity, but in radiation therapy the build-up of voltage and amperage to optimum levels takes place much more slowly. During this build-up period, exposure of the patient and of the film should be avoided, if satisfactory, reproducible radiographic technics are to be developed.

The fundamental requirements for radiography with radiation therapy machines are the interposition of a radiation-impervious barrier between the plane of exit of the x-ray beam from the machine and the patient, and an arrangement for its removal when optimum voltage and amperage have been reached.

These requirements can be met by the use of a gravity-activated lead shutter (fig. 1) which can be positioned to cover the end of the cone or other collimating device through which the x-ray beam is emitted (fig. 2A). When the operator is ready to make the exposure, he causes the shutter to drop instantaneously from the path of the beam.

This device consists of an iron frame, within which a movable lead barrier of appropriate thickness slides up and down easily. The lead barrier is just large enough to cover the egress of the x-ray beam. For use with the 1,000,000-volt machine, the lead shutter is 1 inch thick, while it measures one-eighth inch in thickness for the 200-kv machine. The length of the frame is approximately twice that of the lead barrier, in order to provide enough

From Walter Reed Army Hospital, Washington, D. C.



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room for the latter to fall to a nonobstructing position. A small hook (fig. 2B), attached to and controlled by a solenoid at the top of the iron frame, holds the lead barrier in its protective position.

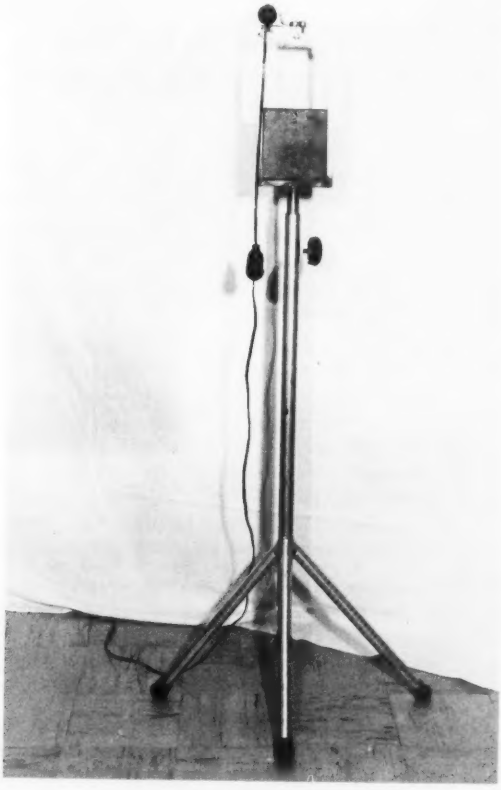

*Figure 1. The gravity-activated shutter.*

The solenoid is connected to a toggle switch near the control panel where the operator stands. The switch permits the solenoid to be activated, causing the hook to be pulled away and permitting the lead shutter to drop by gravity (fig. 3).

## SUMMARY

A gravity-activated lead shutter is described which can be used with radiation therapy machines for radiographic purposes. This protects the patient and x-ray film from exposure during the

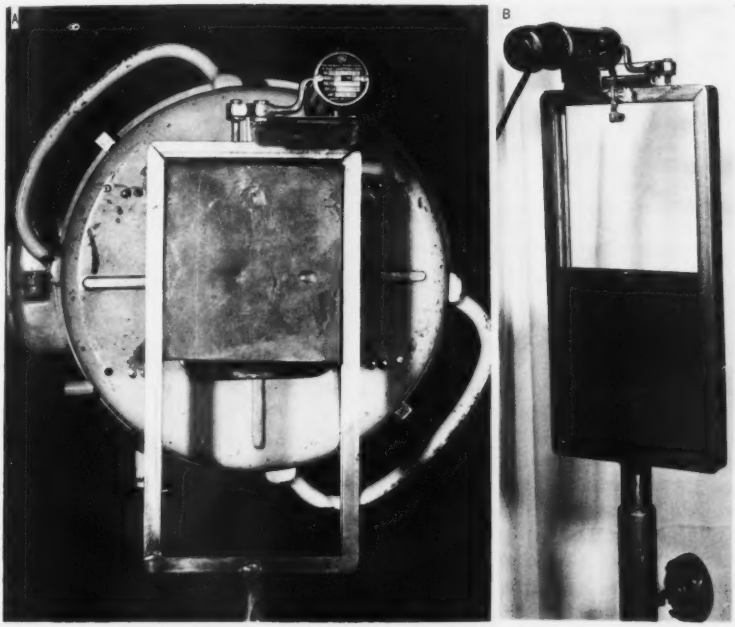


*Figure 2. (A) Shutter covering end of collimator of 1000-kv x-ray therapy machine. (B) Close-up of device showing solenoid and hook to hold shutter in protecting position.*

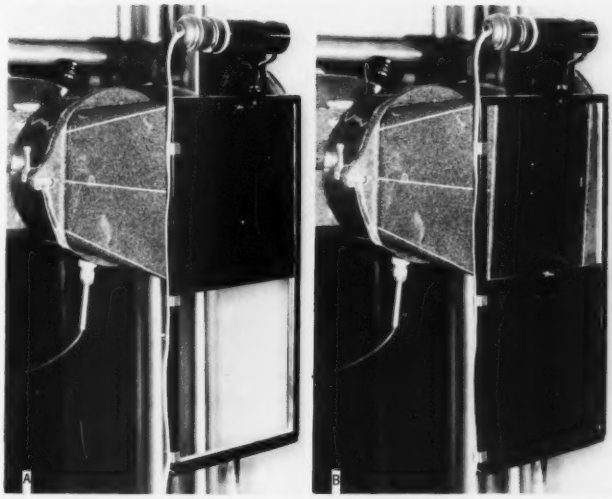


*Figure 3. Device used with 200-kv machine. (A) Shutter covering end of cone. (B) After release of shutter.*

time that voltage and amperage are being raised to optimum levels, and then falls quickly to a nonobstructing position, permitting the exposure to be made.

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## MEDICINE—CIVILIAN AND MILITARY

It is to the benefit of our country that close liaison be continuously maintained between the medical services of the armed forces and those of the civilian population. We as civilians benefit from the research and experience of the armed forces and integrate into our practice the knowledge that they have gained. The armed forces do the same with the results of our civilian research. This close liaison also makes active duty more attractive and profitable for the reserve officer and creates a professional atmosphere that is much more satisfactory to those doctors who choose the regular service as a career. As a final point, this liaison permits us to know better the problems of the service doctor, and armed with this knowledge we can help the services attain professional, economic, and management goals for their doctors, which will go a long way toward providing the corps of regular physicians necessary to give medical service to our military arms.—Waltman Walters: Research, Investigation, and Teaching in the Armed Forces Medical Service (editorial). *A. M. A. Archives of Surgery*, February 1957.

# CHLORMELAMINE AND IODIZED CHLORMELAMINE GERMICIDAL RINSE FORMULATIONS

## Essential Physical and Chemical Characteristics, and Germicidal Efficiencies

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GERALD BERG, *Ph. D.*

IN COMPOUNDING a germicidal rinse for the U.S. Army, the following factors were taken into consideration: (1) a large number of service men dip their partially cleaned mess gear into the same rinse; (2) the duration of each dip is probably a matter of seconds; (3) the germicidal rinse must be prepared with water available in the field; (4) the compound must be packaged in nonbreakable containers which may be stored under tropical conditions for a long period of time; (5) the rinse must be usable for disinfection of fresh vegetables and fruits.

With these prerequisite conditions, it is clear that the disinfectant incorporated into the rinse composition must not only have a high efficiency in destroying pathogenic bacteria, viruses, and protozoan cysts over a wide temperature range, but must also be stable during high temperature storage and retain its activity in the presence of ever increasing amounts of food waste or other organic matter during the period of use. The compound also must contain enough surfactant to wet the greasy surfaces of mess gear and the waxy surfaces of fresh vegetables and fruits.

These necessary properties limited the field of selection almost exclusively to the N-chlor compounds. Organic hydroperiodides, such as the tetraglycine hydroperiodide used in water disinfection,[1] which liberate elemental iodine in solution, are promising disinfectants but generally lack the stability to fulfill the packaging and storage requirements. Molecular iodine ($I_2$), however, can be used as the principal disinfectant by incorporating into the rinse composition a stable iodide which is oxidized to $I_2$ when the rinse is prepared.

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This work was done at Harvard University and at the Robert A. Taft Sanitary Engineering Center in a series of projects supported by the Office of the Quartermaster General, U. S. Army.

Of the N-chlor compounds, the monochlor members (monochloramine-T, azochloramide, etc.) possess inadequate germicidal activity, and the dichlor members (halazone, dichlorodimethylhydantoin, etc.) are not sufficiently stable to fulfill the packaging, storage, and organic matter tolerance requirements. A third group of N-chlor compounds, represented by trichlormelamine (TCM) and hexachlormelamine, has received relatively little attention in the field of disinfection. Hexachlormelamine is not sufficiently soluble to be of practical use and TCM liberates insufficient HOCl (at neutral and slightly alkaline pH) to be an adequate water disinfectant, unless modified.[2]

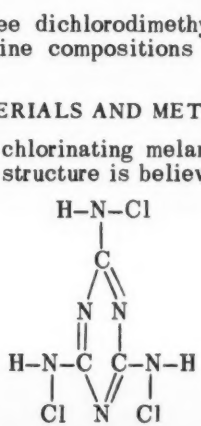
However, the complex molecular structure and the presence of three chlorine atoms in each molecule of TCM indicate that this N-chlor compound has a greater potential than the dichlor compounds for the release of HOCl and that factors such as pH and temperature may have profound effects on HOCl release. In a preliminary study, it was found that TCM liberating 200 ppm of titrable chlorine at acid pH produced impressive rates of destruction of *Streptococcus pyogenes, Streptococcus faecalis, Staphylococcus aureus,* and *Escherichia coli.*[3]

Since TCM is stable, especially when mixed with an acid (see below), it appeared that a composition containing TCM and acid would possess greater germicidal activity than the dichlor, and yet maintain the stability of the monochlor compounds. Under an agreement with the Army Quartermaster General, the Wallace and Tiernan Company, New Jersey, undertook the formulation of TCM compositions. Samples of several compositions were furnished by that company for experimental studies; the one that appeared most promising is described in this report. The company undertook also the task of compounding iodized-TCM formulations with "coated" KI to prevent the release of $I_2$ during storage. Samples of several of these formulations were also received and experiments on the one that appeared most promising are also reported here.

For comparison, three dichlorodimethylhydantoin (DDH) compositions and two iodine compositions were included in some parts of the study.

## MATERIALS AND METHODS

TCM is prepared by chlorinating melamine (2, 4, 6 triamino-s-triazine). Its chemical structure is believed to be



The theoretical active chlorine content of this compound is 46.3 per cent by weight or 92.6 per cent by titration, and averages 91 per cent in actual titration. The formation of several isomers is possible; the commercial product probably contains some or all of them. TCM powder is whitish in color. Because it is hydrophobic, a wetting or "carrying" agent – usually an inorganic salt – is needed to solubilize it rapidly in water. At room temperature, its solubility reaches about 300 ppm (parts per million) titrable chlorine at equilibrium; at 5° C, its solubility is reduced to about 100 ppm.

TCM is one of the most stable of the N-chlor compounds. Heating the powder at 100° C for days or boiling it in solution for short times results in little loss of titrable chlorine. Stability is increased when TCM is mixed with an acid. In aqueous solutions, as determined by amperometric titration, liberation of HOCl increases as pH decreases approaching a maximum at pH 3.0. TCM can be mixed with anionic or cationic detergents without affecting its titrable chlorine; its titrable chlorine is affected, however, by the presence of oxidizable nonionic detergents.

*TCM compositions.* The ingredients compounded in the TCM compositions are as follows:

| Ingredients | Per cent by weight | |
|---|---|---|
| | Minimum | Maximum |
| TCM | 21.5 | 27.5 |
| Sodium dodecyl benzene sulfonate | 11.5 | 12.5 |
| Anhydrous citric acid | 51.0 | 55.0 |
| Anhydrous $NaH_2PO_4$ | Remainder | |

A 0.1 per cent solution of a composition in distilled water contains from 197 ± 5 to 248 ± 6 ppm titrable chlorine, a surface tension of 39 ± 0.7 dynes per cm at 25° C, and a pH of 2.8 ± 0.1.

*Iodized TCM compositions.* The iodized TCM compositions are prepared by incorporating KI in the TCM formulations described above. The amount of KI used in each composition depends upon the concentration of titrable $I_2$ desired. The surface tension and pH of the TCM compositions in solution do not change significantly in the presence of the KI concentrations incorporated.

*Dichlorodimethylhydantoin (DDH) compositions.* Three DDH compositions were available. A sample of one, designated as dichlorodimethylhydantoin composition, was furnished by W. D. Tiedeman of the New York State Health Department. Samples of the other two compositions were received from the Office of the Quartermaster General. The latter were designated as IDDH I and II (improved dichlorodimethylhydantoin compositions I and II). According to the suppliers, the ingredients, titrable chlorine, pH, and surface tension of 0.1 per cent aqueous solutions of each of these compositions were as follows:

| Ingredient | Per cent by Weight DDH Formula | IDDH I | IDDH II |
|---|---|---|---|
| DDH (dichlorodimethylhydantoin) | 25 | 58 | 58 |
| Alkyl naphthalene sulfonate – 80 per cent active | 10 | 0 | 0 |
| Alkyl naphthalene sulfonate (NSAE) | 0 | 2 | 0 |
| Alkyl aryl sulfonate (Kreelon 8D, 80 per cent active) | 0 | 0 | 7 |
| Anhydrous citric acid | 0 | 40 | 35 |
| Sodium dihydrogen phosphate | 5 | 0 | 0 |
| Sodium sulfate (anhydrous) | 15 | 0 | 0 |
| Sodium chloride | 45 | 0 | 0 |
| (As 0.1 per cent solution in distilled water) | | | |
| Titrable chlorine, ppm | 170 ppm | 383 ppm | 387 ppm |
| Surface tension (dynes/cm. at 25°) | 49-50 | 53.5 | 36.0 |
| pH at 25° C | 5.0 | 3.0 | 3.1 |

*Iodine compositions.* Samples of two iodine compositions, designated as iodine compositions I and II, were received from the Office of the Quartermaster General. Iodine composition I reportedly contained the following ingredients by weight: 5 per cent elemental iodine, 30 per cent polyethylene oxide, and 65 per cent urea; in actual titration, however, this composition contained 8.33 per cent total iodine by weight, at least 6 per cent of which was in titrable form. Iodine composition II reportedly contained the following ingredients by weight: 59 per cent trisodium triiodo-ethylene-diamine-tetraacetate dihydrate ($Na_2C_{10}H_{12}N_2O_3I_3.2H_2O$), 12.5 per cent ultrawet K Dense (detergent), 20 per cent anhydrous citric acid, and 8.5 per cent anhydrous sodium dihydrogen phosphate. A 0.1 per cent solution of this composition reportedly contained 200 to 220 ppm of titrable iodine and had a pH of 3.1. Determinations in our laboratories demonstrated a titrable iodine content of 190 ppm and a pH of 3.3 to 3.4.

*Test organisms. Escherichia coli* was used in the bactericidal tests. Suspensions were prepared by repeated centrifuging of bottle-culture washings and resuspending the settled cells in normal saline to give an approximate concentration of $1 \times 10^{10}$ organisms per ml. Cysts of the NRS strain of *Endamoeba histolytica* were used in the cysticidal tests. The methods for producing cysts in culture, purifying cyst suspensions, and enumerating cysts have been described in two previous reports.[2,4]

The Connecticut 5 strain of coxsackie group B, type 1 virus was used in most of the viricidal tests. In several tests, the MEF1 strain of poliovirus type 2, the Mahoney strain of polio-

virus type 1, the NIH 93 strain of coxsackie group A, type 2 virus, and the Wallace strain of echo 7 virus were used. Since the viricidal part of the study will be presented in detail in a separate report (in preparation), the methods for preparing virus suspensions, purifying the suspensions when necessary, and testing for virus survival are omitted in this presentation. It should be noted, however, that the $LD_{50}$ end point method was used in computing virus concentrations determined by animal inoculations, and the most probable number method[5] was used in computing virus concentrations determined by the inoculation of monkey kidney tissue cultures.

Titrable chlorine or iodine was measured by the acid-starch-iodine method. Titrable iodine in the presence of titrable chlorine was determined photometrically after $CHCl_3$ extraction.

*Germicidal test conditions.* To provide a margin of safety for field use, germicidal rinse compositions should be evaluated under test conditions representative of the most adverse field situations likely to be encountered. Among the interfering factors, alkalinity, organic matter, and temperature are the most important. Alkalinity, normally present as bicarbonate in natural waters, was supplied in the test water by the use of $CaCl_2$ and $NaHCO_3$. Alkalinity is expressed in ppm $CaCO_3$.

Selection of organic matter required some consideration. Preliminary tests on a number of organic materials including peptone, mayonnaise, potato, coffee, tea, egg albumin, and milk, demonstrated that peptone was by far the most interfering. On the assumption that a man may leave as much as 20 gm. of food on his partially cleaned mess gear and that 10 per cent of the waste is organic matter, one hundred men may introduce into 25 gallons of germicidal rinse a total of 200 gm. of organic matter. Therefore, the presence of 0.2 per cent peptone in the rinse for a period of 2 hours prior to a germicidal test probably provides a reasonable margin of safety in the interpretation of data for field use.

Hence, all germicidal tests were carried out with distilled water containing 300 ppm bicarbonate alkalinity, which represents the upper limit of alkalinity normally encountered in natural waters, and 0.2 per cent peptone (Bacto) after a 2-hour peptone contact time. In bactericidal tests and in tests carried out with type 2 poliovirus, the survival of which was not affected by a temperature of 50° C, within the contact times used, temperatures of 5° C, 25° C, and 50° C were used. Cysticidal tests were carried out at 5° C, 25° C, and 45° C, because cysts are rapidly destroyed by heat after short contact times at 50° C but not at 45° C.[6, 7] Most of the viricidal tests were carried out at 5° C and 25° C since some of the viruses tested are destroyed rapidly by heat at 45° C.[8]

*Germicidal test procedure.* A weighed amount of the germicidal rinse composition under investigation was dissolved in the bicar-

bonate water at the desired temperature. The peptone was added as soon as the composition had dissolved. Two hours after the addition of peptone, a suspension of test organisms was added which resulted in a test fluid concentration of approximately 100 million bacteria per ml, or 50 cysts per ml, or 1,000 to 50,000 $LD_{50}$ or MPNCU's (most probable number of cytopathogenic units) of virus per inoculum.

After contact times ranging from 15 to 180 seconds, samples in bactericidal and viricidal tests were removed and mixed immediately with known amounts of a neutralizer (containing $Na_2SO_3$, $Na_4P_2O_7$, and glycerine). In cysticidal tests, the neutralizer was poured into the test fluid after each contact time. The neutralized samples were titrated in survival tests for *E. coli* and viruses, and were centrifuged in the cysticidal tests for recovery of viable cysts.

Two controls were used, one without addition of the germicidal composition and one with neutralized composition. Percentages of surviving bacteria and viruses were determined using the numbers present in the controls as the initial concentrations. Cyst concentrations were computed on an all or none basis; the survival of viable cysts indicated a destruction of less than 99.998 per cent of the cysts, while negative cultures demonstrated a destruction of 99.998 per cent of the cysts.

## RESULTS AND ANALYSES

### Essential Physical and Chemical Characteristics of the TCM and Iodized TCM Compositions

*Effect of storage on titrable halogen and surface tension of the TCM and coated KI-TCM compositions.* Dry samples of a TCM composition and an iodized TCM composition containing enough coated KI to replace 17 per cent of the titrable chlorine by titrable iodine were stored in bottles at both 23° C to 29° C and 50° C. These compositions were tested periodically for titrable halogen and surface tension (measured by a calibrated du Nuoy tensiometer). The averages of triplicate determinations and their standard deviations were computed and are presented in Table 1.

Table 1 shows that the TCM composition suffered almost no loss in titrable chlorine or increase in surface tension on storage for as long as 360 days at 23° C to 29° C, or after 90 days at 50° C. Even after 150 days at 50° C, there was no change in surface tension and the loss of titrable chlorine was only about 10 per cent. The coated KI-TCM composition retained its tension at the 38-to-39-dyne per cm level after 180 days of storage at the lower temperature and after 60 days of storage at the higher temperature. There was little loss in titrable halogen after 180 days at 23° C to 29° C, but a loss of about 15 per cent occurred after 60 days at 50° C.

TABLE 1. *Titrable chlorine and surface tension of TCM and coated KI-TCM compositions after varying storage periods.*

| Composition | Storage temperature (°C) | Storage time in days | Solution strength (gm/liter) | Titrable chlorine (ppm) | Surface tension (dynes/cm) |
|---|---|---|---|---|---|
| TCM I | 23-29 | At start | 1.0 | 191 ± 2.5 | 39 ± 0.7 |
| | | 120 | 1.0 | 190 ± 1.4 | 38 ± 0.8 |
| | | 240 | 1.0 | 188 ± 2.2 | 39 ± 0.7 |
| | | 360 | 1.0 | 189 ± 1.1 | 39 ± 0.8 |
| | 50 | At start | 1.0 | 191 ± 2.5 | 39 ± 0.7 |
| | | 60 | 1.0 | 190 ± 2.2 | 38 ± 0.7 |
| | | 90 | 1.0 | 183 ± 4.1 | 39 ± 0.2 |
| | | 150 | 1.0 | 172 ± 2.1 | 39 ± 0.8 |
| Coated KI-TCM* | 23-29 | At start | 1.37 | 202 ± 5.2 | 38 ± 0.8 |
| | | 90 | 1.37 | 190 ± 4.1 | 39 ± 0.4 |
| | | 180 | 1.37 | 186 ± 3.5 | 39 ± 0.9 |
| | 50 | At start | 1.37 | 202 ± 3.2 | 38 ± 0.8 |
| | | 30 | 1.37 | 188 ± 4.6 | 39 ± 0.8 |
| | | 60 | 1.37 | 170 ± 5.6 | 39 ± 0.6 |

*Enough iodide to convert 17% of the titrable chlorine into titrable iodine. Its figures under titrable chlorine are titrable halogen as chlorine.

*Alkalinity tolerance of TCM compositions.* The alkalinity tolerance of the TCM formula was ascertained by determining the pH values of 0.1 percent solutions of the composition without and with 100, 200, 300, 400, and 500 ppm bicarbonate alkalinity. Results of these determinations are presented in Figure 1. This figure shows that the pH of a solution of the TCM composition rose steadily with increase in bicarbonate, but even at a bicarbonate concentration of 300 ppm, a pH of 5.0 was maintained. The pH changes were essentially the same in a 0.137 per cent solution of the iodized TCM composition (the 0.037 per cent increase compensated for the weight of the coated KI).

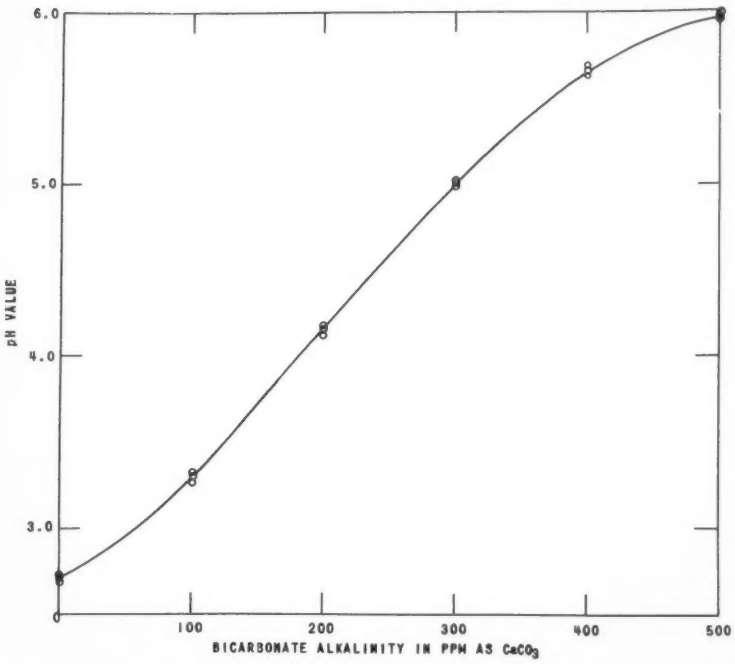



*Figure 1. Effect of added bicarbonate alkalinity on the pH of 0.1 per cent solutions of the chlormelamine formula at 25°C.*

*Stability in solution of TCM compositions.* The stability of the TCM and the iodized TCM compositions in solution was determined by measuring their titrable chlorine or titrable halogen as chlorine after varying periods at temperatures of 5° C, 25° C, and 50° C. For comparison, parallel determinations were made on solutions of the DDH and on those of an iodine composition. These results are summarized in Table 2.

Table 2 shows that the TCM composition was stable in solution for at least 2 hours at all three temperatures. The iodized

TCM composition was completely stable at 5° C and lost less than 10 per cent of its titrable halogen (expressed as titrable chlorine) after 2 hours at 25° C. At 50° C about 12 per cent of the titrable halogen was lost in 30 minutes and about 16 per cent was gone in 120 minutes. The loss of titrable chlorine by the DDH composition was about 80 to 100 percent greater than that by the iodized TCM composition at both 25° C and 50° C. The loss of titrable iodine by iodine composition II was even greater than that by DDH, especially at 50° C.

TABLE 2. *Stability of solutions of four different germicidal rinse compositions on standing at varying temperatures.*

| Composition | Solution strength | Standing time (min) | Titrable chlorine or iodine (ppm) 5°C | 25°C | 50°C |
|---|---|---|---|---|---|
| TCM | 0.1% | Start | 192 | 192 | 192 |
| | | 30 | 189 | 188 | 188 |
| | | 120 | 190 | 189 | 188 |
| Iodized TCM* | 0.137% | Start | 202 | 202 | 202 |
| | | 30 | 200 | 198 | 177 |
| | | 120 | 198 | 185 | 170 |
| DDH | 0.1% | Start | 178 | 178 | 178 |
| | | 30 | 175 | 168 | 152 |
| | | 120 | 173 | 146 | 126 |
| Iodine formula II | 0.1% | Start | 190 | 190 | 190 |
| | | 30 | 188 | 176 | 135 |
| | | 120 | 151 | 126 | 52 |

*Titrable halogen concentrations are expressed as titrable chlorine.

*Form of titrable iodine present in the solution of iodized TCM.* As shown in a previous report,[9] titrable iodine may exist in different forms in solution and different forms possess different germicidal efficiencies. Hence, it is essential to know what form of titrable iodine occurs in the solution of the iodized TCM composition. The absorption spectrum of a solution containing 0.1 per cent TCM composition and 0.0155 per cent KI (to yield a theoretical $I_2$ concentration of 0.0119 per cent) and the spectrum of a 0.0119 per cent $I_2$ solution were determined with a Beckman spectrophotometer. Results of these determinations are presented in Figure 2.

Because the two absorption spectra are almost identical, it is apparent that essentially all of the titrable iodine in a solution of the iodized TCM composition exists as $I_2$.

*Maintenance of residual $I_2$ in the presence of 0.2 per cent peptone in solutions containing iodized TCM composition or ele-*

*mental iodine*. Since the germicidal efficiency of the iodized TCM composition depends chiefly on the $I_2$ formed in solution (see below), it is essential to know the maintenance levels of residual $I_2$ alone. Hence, the residual $I_2$ in a solution of 0.1 per

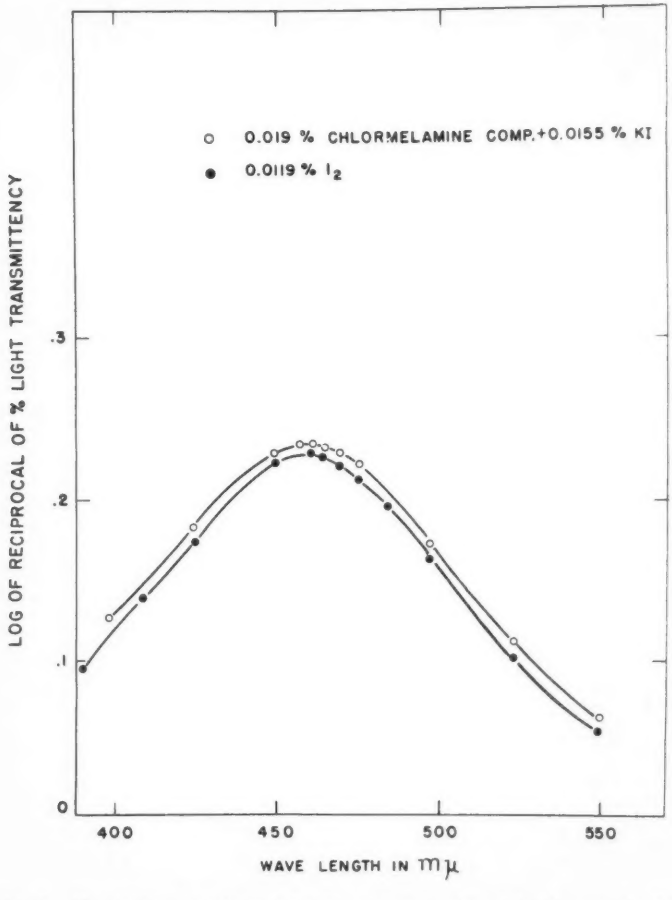



*Figure 2. Absorption spectra of 0.019 per cent chlormelamine composition +0.0155 per cent KI in solution and 0.0119 per cent $I_2$ solution at 25°C.*

cent TCM composition with 0.019 per cent KI in the presence of 0.2 per cent peptone was determined photometrically after varying standing periods at 25° C. A parallel determination was made with a 0.0125 per cent $I_2$ solution. Since iodination of the tyrosine in peptone results in the formation of brownish iodotyrosine and/or diiodotyrosine which may interfere with the determination, $CHCl_3$ was used to extract the $I_2$ from each

sample before making the determinations. Results of these determinations are shown in Table 3.

TABLE 3. *Residual $I_2$ in a 0.0125 per cent $I_2$ solution and in a solution of 0.1 per cent TCM composition with 0.019 per cent KI after contact with 0.2 per cent peptone at 25°C.*

| Standing time in minutes | Residual $I_2$ (ppm) | | | |
|---|---|---|---|---|
| | 0.1% TCM and 0.019% KI | | 0.0125% $I_2$ | |
| | 5° C | 25° C | 5° C | 25° C |
| Start | 124 | 124 | 125 | 125 |
| 30 | 120 | 85 | 88 | 66 |
| 50 | 118 | 83 | 65 | 38 |
| 95 | 112 | 73 | 55 | 35 |
| 120 | 110 | 70 | 50 | 33 |

Table 3 demonstrates that, in the presence of peptone, the iodized TCM composition maintained, on the average, twice as much residual $I_2$ as that maintained by the pure $I_2$ solution. The higher residual maintained by the former is attributed to the fact that as $I_2$ is reduced to iodide by organic matter, the iodide is oxidized back to $I_2$ by residual chlorine. Since the iodine in both iodotyrosine and diiodotyrosine is not available for conversion to $I_2$ by the TCM, it is probable that the residual $I_2$ maintained in the solution of iodized TCM composition would be still higher under field conditions where tyrosine is unlikely to be present at such high concentrations.

*Efficiencies of germicidal rinse compositions.* At a meeting of the Subcommittee on Food Supply of the Committee on Sanitary Engineering and Environment of the National Research Council in Washington, D. C., 10-11 January 1952, it was recommended that a 99.999 per cent destruction of *E. coli* within 20 seconds should be used as a standard in evaluating the germicidal efficiency of a rinse composition for military use. To provide an even wider margin of safety for field use, the bactericidal efficiency standard used in the present evaluation was 99.999 per cent destruction in 15 seconds or less.

Since determination of the rate of destruction of amoebic cysts by the most probable number method is too time consuming to be practical, the cysticidal efficiency standard was set as negative cultures in 15 seconds or less. As indicated previously, with a cyst density of 50 per ml in a 1-liter sample, a negative culture indicates a 99.998 per cent destruction.

At the outset, no standard was established for viricidal efficiency.

Initially, the bactericidal efficiencies of several germicidal rinse compositions were evaluated against *E. coli* under the test conditions described. From the data obtained, the per cent destruction in 15 seconds was interpolated and is presented in Table 4.

TABLE 4. *Efficiencies of various germicidal rinse compositions in the destruction of* E. coli *under specified test conditions.*

| Composition | Per cent in solution | Temperature °C | Chlorine or $I_2$ concentration (ppm) | | Per cent destruction in 15 seconds |
|---|---|---|---|---|---|
| | | | Initial | Residual* | |
| TCM | 0.1 | 5 | 200 | 102-135** | 30-60 |
| | | 25 | 225 | 126-163 | 98.0-99.8 |
| | | 50 | 202 | 86-102 | 94-98 |
| TCM<br>KI | 0.1<br>0.017 | 5 | 203 | 99-103** | Mostly >99.999<br>Few 99.92-99.99 |
| | | 25 | 203 | 98-120 | >99.999 |
| | | 50 | 203 | 85-99 | Mostly >99.999<br>Few 99.8-99.99 |
| TCM<br>KI | 0.1<br>0.019 | 5 | 225 | 113-137** | 99.999 |
| | | 25 | 221 | 98-105 | 99.999 |
| | | 50 | 225 | 83-109 | 99.999 |
| IDDH I | 0.1 | 5 | 358 | 268-286 | 90-94 |
| | | 50 | 358 | 35-51 | 97-99.999 |
| IDDH II | 0.1 | 5 | 362 | 224-225 | 70-80 |
| | | 50 | 362 | 43-52 | 90-99.999 |
| Iodine I | 0.15 | 5 | 100 | 24 | 96-99 |
| | | 50 | 100 | 0 | None |
| Iodine II | 0.1 | 5 | 190 | 96-108 | 99.999 |
| | | 25 | 181 | 51-54 | 99.999 |
| | | 50 | 170 | 5-8 | 12-15 |

*The residuals for iodized TCM compositions are expressed as titrable halogen as chlorine.
**Titrable halogen in solution.

Table 4 shows that when tested in the presence of 300 ppm of bicarbonate alkalinity and 0.2 per cent peptone after a 2-hour peptone contact time, only the two iodized TCM compositions satisfied the bactericidal requirement at all three temperatures. In some of the tests with the two improved DDH compositions, satisfactory results were obtained at 50° C, but not at 5° C. The bactericidal efficiency of iodine composition I was unsatisfactory at 5° C and 50° C and composition II was satisfactory only at 5° C and 25° C.

The cysticidal efficiencies of the two iodized TCM compositions were then determined. For comparison, a TCM composition and the two improved DDH compositions were included in these experiments. The results presented in Table 5 demonstrate that only the two iodized TCM compositions fulfilled the cysticidal requirement. Of these two compositions, only the one which contained 0.019 per cent KI was consistently satisfactory in performance at all temperatures.

Preliminary viricidal tests carried out with the type 2 poliovirus revealed that relatively unimpressive amounts of destruction are obtained at 5° C to 50° C in 30 seconds with the iodized

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TABLE 5. *Cysticidal efficiencies of five germicidal rinse compositions under specified test conditions.*

| Composition | Per cent in solution | Temperature (°C) | Titrable halogen (ppm)* | | Time in seconds for negative cultures |
|---|---|---|---|---|---|
| | | | Initial | Residual | |
| TCM | 0.1 | 5 | 202 | 98-128 | 3,000-3,600 |
| | | 25 | 202 | 110-151 | 240-300 |
| | | 45 | 202 | 88-98 | 30-60 |
| TCM<br>KI | 0.1<br>0.017 | 5 | 202 | 98-132 | 15 |
| | | 25 | 202 | 101-102 | 15-30 |
| | | 45 | 202 | 93-106 | 15 |
| TCM<br>KI | 0.1<br>0.019 | 5 | 220 | 119-152 | 15 |
| | | 25 | 220 | 114-154 | 15 |
| | | 45 | 220 | 103-111 | 15 |
| IDDH I | 0.1 | 5 | 359 | 282-305 | >900 |
| | | 25 | 359 | 165-176 | <300 |
| | | 45 | 359 | 64-75 | 30-60 |
| IDDH II | 0.1 | 5 | 373 | 288-305 | >900 |
| | | 25 | 373 | 231-243 | <300 |
| | | 45 | 373 | 80-88 | 30-60 |

*Concentration of halogens are expressed as titrable chlorine in solutions containing more than one halogen.

TCM compositions and that even poorer results are obtained with the TCM and DDH compositions. While the presence of significant amounts of extraneous organic matter in the crude virus suspensions may have reduced the efficiencies of these compositions, there were definite indications that the virus is more difficult to destroy than either *E. coli* or amoebic cysts. The viricidal part of the evaluation, therefore, was devoted to determining how changes in TCM and iodide content would affect the viricidal efficiencies of the iodized compositions, and whether enteroviruses differ in resistance to these compositions. Again, for comparison, the TCM compositions were included in the study. These evaluations (Table 6) demonstrate clearly that both type 1 poliovirus and type 7 echo virus are less resistant than coxsackie B1 virus to destruction by the TCM II-KI composition (25 per cent titrable chlorine, 0.039 per cent KI). Coxsackie A2 virus was destroyed at a rate comparable to that obtained with coxsackie B1 virus. It is clear that the iodized TCM compositions are considerably more viricidal than the TCM compositions.

TABLE 6. *Viricidal efficiencies of TCM and iodized TCM compositions in water with 300 ppm bicarbonate alkalinity.**

| Composition | Titrable chlorine content (%) | Per cent in test solution | Virus tested | Peptone (%) | Per cent destruction in 15 seconds | |
|---|---|---|---|---|---|---|
| | | | | | 5° C | 25° C |
| | | | Coxsackie A2 | 0 | -- | 35-45 |
| | | | | 0.2 | -- | 10-15 |
| TCM I | 22.5 | 0.1 | | | | |
| | | | Coxsackie B1 | 0 | 15-25 | 50-60 |
| | | | | 0.2 | -- | 10-15 |
| | | | Coxsackie B1 | 0 | 20-30 | 70-85 |
| TCM II | 25.0 | 0.1 | | 0.2 | 0 | 10-15 |
| TCM I | 22.5 | 0.1 | Coxsackie B1 | 0 | 60-65 | 98.0-99.5 |
| KI | -- | 0.019 | | 0.2 | -- | 90-93 |
| TCM II | 25.0 | 0.1 | Coxsackie B1 | 0 | 60-65 | 98.0-99.5 |
| KI | -- | 0.019 | | 0.2 | <20-30 | 92.0-97.0 |
| | | | Coxsackie B1 | 0 | 70 | 99.6-99.9 |
| | | | | 0.2 | 30-40 | 99.0 |
| TCM II | 25.0 | 0.1 | | | | |
| KI | -- | 0.039 | Poliovirus 1 | 0 | 90 | 99.999 |
| | | | | 0.2 | 50-60 | 99.900 |
| | | | Echo 7 | 0 | 90 | 99.999 |
| | | | | 0.2 | 60-70 | 99.950 |

*The final pH ranged from 4.7 to 5.4.

However, if either coxsackie virus had been designated a standard test organism, the maximum destruction obtainable with the iodized compositions in 15 seconds at 5° C would have been 70 per cent in the absence of peptone and 40 per cent in the presence of 0.2 per cent peptone. In 15 seconds, at 25° C, no more than 99.9 per cent destruction was obtained in the absence of peptone, and no more than 99 per cent destruction was obtained in the presence of peptone. The composition containing 0.039 per cent KI was more viricidal than the composition containing 0.019 per cent KI, and the compositions containing 25 per cent titrable chlorine were slightly more viricidal than those containing 22.5 per cent titrable chlorine.

In view of the low efficiency exhibited by the iodized TCM compositions in the viricidal tests, it was desirable to determine the maximum rate of virus destruction obtainable with $I_2$. Using solutions containing $I_2$ and KI with an $I_2$:I molar ratio of about 1:2 and a pH of about 6.0, the destruction of coxsackie B1 virus was studied at 25° C. Since it has been shown that the amount of $I_3^-$ ion formed in a solution of elemental iodine with a fixed $I_2$:$I^-$ ratio increases with increase in strength of the solution, and since $I_3^-$ has no detectable viricidal activity,[9] the amounts of titrable iodine present as $I_2$ in these solutions were computed. Results from these determinations and computations are presented in Table 7.

TABLE 7. *Destruction of coxsackie B1 virus by solutions of elemental iodine and iodide at 25°C and pH 6.0.*

| Residual titrable iodine (ppm) | Computed titrable iodine as $I_2$ (ppm) | Percent destruction in 15 seconds |
|---|---|---|
| 250 | 107 | 90.00 |
| 278 | 114 | 91.00 |
| 368 | 128 | 94.00 |
| 467 | 141 | 97.00 |
| 1,224 | 230 | 98.50 |
| 1,407 | 252 | 99.00 |
| 1,592 | 272 | 99.00 |
| 1,999 | 300 | 99.40 |
| 2,517 | 350 | 99.96 |
| 2,654 | 360 | 99.98 |
| 2,814 | 370* | 99.99 |
| 3,004 | 370 | 99.99 |
| 3,392 | 370 | 99.99 |

*Maximum solubility of $I_2$ in water at 25° C.

As expected, the virus destruction correlates more closely with the computed $I_2$ levels than with the residual titrable iodine. This is indicated by the fact that the 97 and 99.4 per cent destruction levels obtained in 15 seconds with 141 ppm and 300 ppm of computed $I_2$, respectively, were close to the destruction levels observed with the iodized TCM compositions containing 0.019 per cent and 0.039 per cent KI (in the absence of peptone) which should have liberated 145 and 300 ppm $I_2$, respectively.

It is apparent that even with a maximum amount of KI, the iodized TCM composition cannot destroy significantly more than 99.99 per cent of coxsackie B1 virus in 15 seconds at 25° C. Since the solubility of $I_2$ is less at 5° C than at 25° C and because the value of $Q_{10}$ (the temperature coefficient for a 10-degree change) is probably greater than 2.0 for the destruction of coxsackie B1 virus by $I_2$[9], the rate of virus destruction at 5° C

is probably considerably lower than that obtained at 25° C. After a 2-hour contact with 0.2 per cent peptone, the reduced $I_2$ residuals would inflict even less destruction on the virus. This reduction explains why the iodized compositions destroyed at 5° C in 15 seconds only 60 to 70 per cent of coxsackie B1 virus in the absence of peptone, and less than 20 to 40 per cent of the virus in the presence of 0.2 per cent peptone. It also explains why at 25° C, only 92 to 99 per cent of the virus was destroyed in 15 seconds in the presence of 0.2 per cent peptone.

## SUMMARY AND CONCLUSIONS

On the basis of data presented, the following outstanding features are summarized:

1. TCM is one of the more suitable N-chlor compounds for use in a germicidal rinse composition because of its high stability, moderate solubility, and relatively low affinity for organic matter. The TCM compositions described in this report fulfill the stability and surface tension requirements and maintain a satisfactory pH in the presence of bicarbonate alkalinity up to 300 ppm. However, the bactericidal, cysticidal, and viricidal activities of the TCM compositions fall far short of that desired, especially at 5° C.

2. Iodide incorporated into the TCM composition greatly increases the germicidal efficiency of the composition without altering its other properties. When 0.019 per cent KI is used in a 0.1 per cent solution of a TCM composition (200 to 250 ppm titrable chlorine) in the presence of 300 ppm bicarbonate alkalinity and 0.2 per cent peptone, 99.999 per cent destruction of *E. coli* and an estimated 99.998 per cent destruction of *E. histolytica* cysts are obtainable in 15 seconds at 5° C, 25° C, and 45°C. Fifteen second destruction of coxsackie B1 virus, however, is not much greater than 30 per cent at 5° C and less than 99 per cent at 25° C. The bactericidal data are less consistent when the KI content is reduced to 0.017 per cent. Viricidal results are improved when the titrable chlorine level is increased to 250 ppm and the KI concentration is increased to 0.039 per cent. In 15 seconds, in the presence of 0.2 per cent peptone, the latter compound can destroy 60 to 70 per cent of either type 1 poliovirus or type 7 echo virus at 5° C and 99.9 to 99.95 per cent at 25° C.

3. Due to the limited water solubility of $I_2$, the greatest level of destruction obtainable with this halogen against coxsackie B1 virus at 25° C in the absence of peptone was 99.99 per cent.

At the present time, the iodized TCM composition containing 250 ppm titrable chlorine and 0.039 per cent KI appears to represent the upper limit that can be developed for use as a germicidal rinse under the prescribed requirements. If a disinfectant more powerful than $I_2$, (e.g., HOCl) is used in the composition, the stability of the composition both on storage and under the specified testing conditions becomes questionable. The iodized

TCM composition, therefore, is presently the most promising one available for military uses. However, if coated KI is used in the composition, the stability of the composition must be thoroughly studied.

Because time is no problem in the rinsing of fresh vegetables and fruits, the 15-second germicidal performance required of the composition in mess gear sanitation is resolved in the former operation. Since a 6-to-8-minute contact will facilitate 99.999 per cent destruction of coxsackie B1 virus even at 5° C in the presence of 0.2 per cent peptone, a 10-minute soaking of vegetables or fruits should provide a wide margin of safety provided that all the surfaces are exposed to the rinse.

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# SURGICAL CARE OF THE CONFEDERATE STATES ARMY

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ON April 2, 1865, a courier handed President Jefferson Davis a note as the President of the Confederate States of America was attending services at St. Paul's Church in Richmond, Virginia. President Davis flushed portentously, rose to his feet, and left the church. Petersburg had fallen; the siege of Richmond had been lost. Soon the exodus from Richmond began, and, with it, the southern end of the city was fired. Tobacco warehouses burned, as did two important houses, which, with their contents, were completely destroyed. One of these was the office of Surgeon-General Samuel P. Moore, and the other was the house adjacent, in which were stored records and reports, pertinent to his office, that had been accumulating for the four years of the War Between the States. Following the loss of this invaluable material, the preparation of an adequate history of the Medical Corps of the Confederate States Army, or even of a complete roster of its personnel, became an impossible task.[1]

## THE SCOPE OF THE PROBLEM OF THE MEDICAL CORPS OF THE CONFEDERATE STATES ARMY

The Medical Corps of the Confederate States Army was made up entirely of general practitioners who had served in all parts of the South during their professional lives in the preceding period of unbroken peace, and this left them totally unprepared for the vast amount of traumatic surgery which they were to face. Little, too, did they know of field sanitation. To add to their problems, the armies, collected hastily to repel invasion, were fed defi-

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ciently, were poorly equipped, and were paid almost not at all. However, in spite of virtually no surgical equipment and no textbooks on surgery, this small but valiant corps of army surgeons, with their assistants and their ancillary corpsmen, made an heroic and enviable record throughout the horrible four years of suffering which became an inseparable part of the army of the South. How well the leaders of the Medical Corps of the Confederate States Army overcame these basic obstacles will be seen. However, the statistics of diseased and wounded, when compared with those of the North, bring this story into focus with accent upon its epic proportions.

Confederate forces actively engaged in the four-years' War Between the States numbered no more than 600,000 troops. This small force faced a total number of 2,800,000 soldiers mustered into the Northern Army, or approximately four times the fighting contingent of the Confederate States. Of these 600,000 Confederate troops, 54,000 were killed outright and approximately 200,000 died either from wounds of battle or from disease. Another 200,000 were lost to the Confederate States Army as prisoners of war because of the policy of non-exchange of prisoners adopted and enforced by the United States. Approximately 100,000 were discharged because of disability from wounds, disease, or desertion during the war years. Of this small force, horribly decimated at the end, approximately 3,000,000 cases of wounds and disease were cared for by the Medical Corps of the Confederate States Army. Thus, on an average, each Confederate soldier was disabled by wounds and sickness about six times during the war![1] On April 9, 1865, as the war ended, General Lee could not muster 10,000 men who were fit for active warfare from his former great army of northern Virginia. Dick Ewell surrendered with only 8,000 men to Phil Sheridan.

In contrast to the statistics of killed and wounded is the shockingly high figure of losses due to illness in the field. The troops of the Confederate States Army were drawn from rural districts and had never been exposed previously to contagious illnesses; thus, exposure from crowding made contagion a frightful scourge of the army. Measles, a disease regarded lightly under ordinary conditions, struck terror in the Civil War camps, for its sequelae were pneumonia and phthisis. Eruptive diseases, glandular affections, tuberculosis, capillary bronchitis, typhoid and malarial fevers, diarrhea and dysentery were the chief causes of mortality and deterioration of strength in the Confederate States Army.[2] Aiding and abetting natural exposure of this type were fatigue, deficient food which was often spoiled, clothing which was often ragged or lacking, no water purification, poor shelter, exposure to sudden changes of temperature and to dampness and wetting, as well as indifference to or ignorance of field sanitation.

## DRUGS AND INSTRUMENTS

The desperate shortage of medical supplies and instruments which resulted from the Union blockade necessitated heroic improvisations. "To supply medicines which were declared by the enemy to be contraband of war, our Medical Department had to seek in the forests for substitutes and to add surgical instruments and appliances to the small stock at hand as best they could."[3] When Fort Sumter was fired upon, the entire male student body of the University of South Carolina joined the Confederate States Army, while the faculty became the pharmaceutical house for the Confederate States Medical Corps. The principal text in pharmacology was a war-time book prepared by Dr. Francis Peyre Porcher, Professor of Materia Medica and Therapeutics at the medical college in Charleston. This text was entitled, "Resources of the Southern Fields and Forests, Medical, Economical, and Agricultural, Being Also a Medical Botany of the Southern States, with Practical Information on the Useful Properties of the Trees, Plants and Shrubs."[4]

The number of skilled instrument makers in the Southern States was small. There were, however, purchasing agents in London and in Nassau whose duty it was to purchase and forward supplies which were otherwise completely unobtainable. In addition, raids upon the relatively unguarded Northern supply lines were frequent during the early part of the war at a time when the cavalry of the South was superior. One such raid netted the cavalry of Nathan Bedford Forrest a cache of medical supplies estimated to be worth $150,000. Too, smuggling of quinine and morphine was common by southern ladies who secreted these drugs amongst their many petticoats as they crossed the lines.[5]

*Texts.* Textbooks were scarce, and scientific intercourse with foreign countries came to a virtual halt. To fill this intellectual gap, two excellent manuals of military surgery were published, one in 1862 and one in 1863.[2,6] Beginning in 1864, the "Confederate States Medical and Surgical Journal" was issued monthly for fourteen consecutive numbers. This reached the hospitals and occasionally got into the field. In this excellent journal, original articles were printed with abstracts of recent foreign periodicals, offering the reader an epitome of military medical experience in the North and the South, as well as of the current literature in peaceful European countries.[7]

## ORGANIZATION OF THE MEDICAL CORPS

Shortly after the outbreak of the War Between the States, President Jefferson Davis appointed Samuel Preston Moore of Charleston, South Carolina, the Surgeon-General. As Surgeon-General of the Confederate States Army, Moore organized an efficient medical and surgical department. It was necessary for General Moore to

establish large pharmaceutical laboratories to convert indigenous plants and barks into drugs which could be used by the Medical

*Figure 1. The most colorful surgeon in the Confederate States Army was Hunter Holmes McGuire, M.D. While a medical student in Philadelphia, McGuire led a revolt of about 300 Southern medical students, who left schools in the North for ones in the South at the time of the John Brown episode. As Medical Director of "Stonewall" Jackson's corps, McGuire was held in high esteem by his commander, who mentioned him often in his dispatches. It was McGuire's sad task to have to amputate General Jackson's arm after the latter was wounded accidentally at Chancellorsville. The operation was successful, but Jackson died of a complication upon his eighth postoperative day.*

*McGuire, with Jackson, was responsible for first release of captured Union Army surgeons, a practice—adopted later by both the North and the South—which antedated formation of the Red Cross. McGuire worked hard in the post-war period to eradicate from history books the story of the Civil War which had been slanted towards the Northern point of view. A leader in his field as well as a master surgeon, McGuire was honored by being made president of the Southern Surgical Association, A.M.A., and the American Surgical Association.*

*Figure 2. Captain Sally B. Tompkins, C.S.A., was the only woman commissioned by the Confederacy. A philanthropist and humanitarian, Sally Tompkins established and maintained financially the Robertson Hospital in Richmond, which made an enviable record. An executive order was issued early in the war, placing all private hospitals under government control, but, because this order threatened to lose the Confederacy a needed benefactor, President Davis commissioned Sally Tompkins a captain in the Confederate States Army. Miss Tompkins accepted the commission but refused to place herself on the payroll.*

Corps. It was necessary for him to promote and administer the manufacture of surgical instruments and appliances. It was he who established a large and efficient hospital service and a field ambulance corps. Jefferson Davis stated, "It would be quite be-

yond my power to do justice to the skill and knowledge with which the Medical Corps performed their arduous task. I regret that I have no report which would enable me to do justice to the officers of his [Samuel Preston Moore's] corps, as well in regard to humanity as in their professional skill."[3]

The Quartermaster Branch, or purveyor section of the Medical Corps, was established by Dr. Thomas H. Williams.

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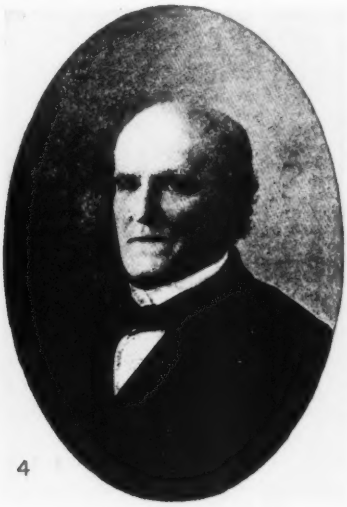

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*Figure 3. J. B. Bean, M.D., D.D.S. was a contract dentist from Chattanooga whose intermaxillary wiring revolutionized the care of jaw fractures and presaged modern care of these injuries.*

*Figure 4. Superintendent of Hospitals of the C.S.A., S. H. Stout, M.D., had been in charge of Gordon Hospital in Nashville and of hospitals in Chattanooga, and proved himself an extremely able and tactful administrator. It was stated that, because of Stout's medical organization, Johnston's army was strengthened by at least a full division of fighting men. Stout became Medical Director of the Hospitals of the Department and Army of Tennessee.*

Although an active roster of the medical corps is not available, usually each separate command engaged in the field had one surgeon and two assistant surgeons, so if one added units not in the field to those actively engaged in combat, it is estimated that there were approximately 2,000 surgeons and 4,000 assistant surgeons, or a total of 6,000, which comprised the Medical Corps of the Confederate States Army.[1]

"More than 3,000,000 cases of wounds and disease were cared for by the Medical Corps in the Confederate States during the war, in addition to which were the 270,000 Union soldiers held as prisoners of war. The efficiency of the department is shown in

part by the fact that the percentage of deaths of Union prisoners of war in the Confederate prisons was little more than 8 per cent, while the percentage of deaths of Confederate prisoners of war in Northern prisons was more than 12 per cent."[3]

At the outbreak of the war, the organization of the Confederate Medical Department was identical with that of the United States Army. There was a surgeon-general with the rank and the pay allowances of a brigadier-general, and there was a medical director in each army corps or department with the rank of colonel. In each division was a chief surgeon (who consolidated reports sent

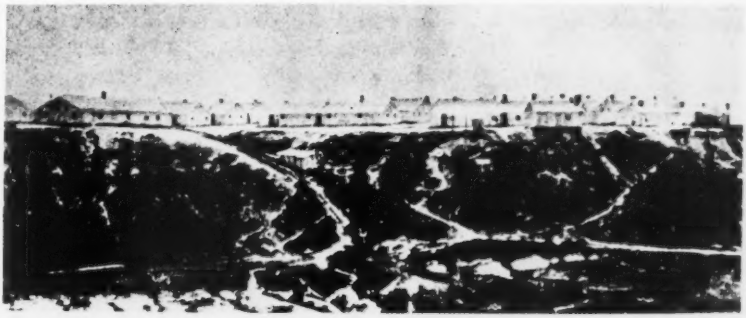

*Figure 5. With 8400 beds, the Chimboraza Hospital is reputed to be the largest ever to exist on this continent. Built upon heights of the same name, Chimboraza, with the Jackson and Winder Hospitals, was one of three largest hospitals in Richmond. A vast hospital center, Richmond had 15 named and 27 numbered hospitals within its environs.*

in by senior surgeons), regiments had a surgeon, who was a major, and an assistant surgeon, a captain, assigned to them. A battalion and sometimes a company of artillery had a captain as an assistant surgeon assigned to them. The services of contract surgeons were provided for. These were civilian physicians who served with pay and allowances of a second lieutenant.

Medical officers were charged with the examination of recruits, who were stripped so that the "free use of their limbs could be observed." It was to be noted whether or not the "chest was ample" and whether the hearing, vision, and speech of the recruit were perfect. The recruit was to have no tumors, ulcerations, extensively cicatrized legs, rupture, or chronic cutaneous affections. He should not have received any contusion or wound to the head previously. It was to be ascertained whether or not the recruit was a drunkard or subject to convulsions or infectious disorders. In giving certificates for discharge because of disability, medical officers were counselled to take particular care that none of the illnesses (such as epilepsy, convulsions, chronic rheumatism, derangement of the urinary organs, or ulcers) were feigned or purposely produced, but even with these definitive admonitions

and in spite of the induction physical examination, many women, masquerading as men, were inducted into the service.

The duties of the surgeon included care of the sick in camp and establishment of field hospitals upon the march. As soon as it was learned from the commanding officer where the troops were to engage in combat, a site for a hospital was chosen, preferably behind a hill or in a ravine for defilade, approximately one-half to one mile in the rear of the line of battle. The wounded were brought from the front on stretchers or in ambulances by members of the regimental band which comprised the infirmary detail whose modern counterparts are the Company Aid Men. The combined medical staff of the brigade or division performed necessary operations. The assistant surgeons were in the rear of the regiment, but in front of the field hospital, giving first aid to the wounded. The dressing station was the forerunner of the Battalion Aid Station. Assistant surgeons adjusted and temporarily cared for fractured limbs, controlled hemorrhage, gave drugs to relieve pain, and made certain that the wounded were carried promptly to the hospital by the infirmary detail or ambulance corps.

The hospital steward, with the pay and rank of a sergeant, was in charge of hospital stores. Usually he was an undergraduate of a medical college with previous experience in the handling of drugs. Cooks and nurses were under the steward and were subject to military control. Ward masters were in charge of personal effects of the patients. In a general hospital there was one steward, one nurse, and ward master, plus one nurse to tend patients. One laundress was provided to 20 and one cook to 30 patients.

The uniform worn by the Medical Corps was similar to that of the line officers, except that the facing of the collar and cuffs was black, while that of the infantry was light blue, that of the artillery scarlet, and that of the cavalry buff. In front of the cap of the military surgeon were the gold letters "M.S." (Military Surgeon), flanked by two olive branches.

It was felt by some that because of the easy manner in which commissions for medical officers were obtained, many were not qualified. However, commissioning boards were established which gave practical examinations to prospective medical officers as well as to those already in the service. The medical knowledge, moral habits, and physical qualifications of the candidates were examined. One such board was headed by Dr. Chaille, later Dean of Tulane University, who stated, "The incompetents were exceptions to the superior merit of the vast majority of the members of the Confederate staff."[8] It was felt generally that the students of the South who had graduated from medical college prior to the onset of the war were better trained than those who were graduated in subsequent years. Dr. Samuel H. Stout, Medical Director of the Department of the Army of Tennessee, said, "When I at-

tended lectures in Philadelphia more than half a century ago, the number of students in the two schools there [University of Pennsylvania and Jefferson] was a little more than 1000. More than half of them were from the Southern states."

## RATIONS AND FIELD SANITATION

The supply of food and water for the troops was established by the Confederate command and promulgated in Chisolm's *Manual of Military Surgery*.[2] Methods of clearing turbid water in the field and of making it potable were suggested. Stagnant or ditch water

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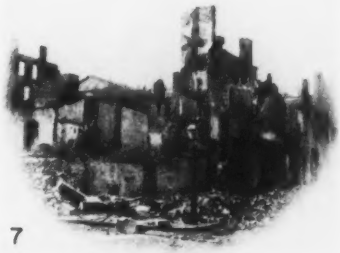

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*Figure 6. A general hospital in the Confederacy. These hospitals were usually composed about equally of buildings and Sibley tents of the tepee type. Patients were segregated according to their state of origin, after a suggestion of Representative James Farrow of South Carolina in 1862, which became law. This segregation was intended to mitigate feelings of homesickness.*

*Figure 7. With defeat at Petersburg, in April, 1865, the Siege of Richmond was lost. Rather than let the city fall intact into Union hands, Richmond was fired. About a tenth of the city burned, but, tragically for the purposes of this chronicle, the Surgeon-General's office and the repository for records of the Medical Corps of the Confederate States Army were amongst the buildings destroyed. Because of this, the story of medicine and surgery in the Confederacy cannot be told authoritatively. A complete roster of the Medical Corps, or even its strength, is not known.*

was to be boiled with a lump of charcoal. A piece of alum was thrown into turbid water to settle it and remove the deposit. It was suggested that water for large units be filtered through a barrel filled with straw.

One ration consisted of three-quarters of a pound of pork or bacon, one and a quarter pounds of fresh or salt beef, 18 ounces of bread or flour, 12 ounces of biscuit, and one and a quarter pounds of corn meal. As a result of discoveries made during the Crimean War, it was suggested that, in the temporary absence of fresh vegetables, lime juice or citric acid be used to prevent scurvy.

*Sanitation.* Unhappily, many regimental camps were accumulations of filth of every description, the odor of which could be detected from great distances. A strong appeal was made to the men for the use of unit latrines. It was suggested that latrines be placed at least 100 yards from the tents and on the down-wind side. It was suggested also that the privies be established over water. This was before the advent of bacteriology, and, hence, pollution of the water supply by sewage went unrecognized and was partially responsible for the dreadful morbidity and mortality from diarrheic and dysenteric diseases. Regulations dictated that latrines were to be prepared immediately upon the establishment of camp, and the men were compelled to use them under penalty. Penalties were rarely imposed, however, and the inconvenience of travelling to a distant latrine was avoided with relative ease by using the camp site.

*Field pack.* The best check list for the field pack was that of Stonewall Jackson, whose men covered such amazing distances on forced marches. Jackson insisted that full field equipment consist of two flannel shirts; two pair of woolen socks, flannel drawers, and shoes; one pair of gaiters; a small case of needles and buttons for mending clothes; a shoe brush with blacking; a comb and hair brush; a tooth brush; one piece of soap; a sponge for washing the body and a towel for drying it; two pocket handkerchiefs; an overcoat; a heavy blanket; and two yards of India rubber cloth to protect the soldier from inclement weather. Jackson stated, "When a person has not more than one change of raiment, the strong impression of *necessity* obliges him to prepare for the return of want. When there is a superfluity, the necessity does not present itself so forcibly, and, hence, the dirty clothes are crammed into the knapsack, where they accumulate in quantity, not obliging the individual to recollect that they are *not* for use unless they are washed."[2] Jackson made no mention of shaving equipment, for he felt that, "Every soldier in the field should allow his beard to grow....[as] it protects his throat and often prevents lung diseases [and] catarrhal afflictions....a heavy mustache is known to protect the wearer to a certain extent from malarial influences, acting as a sieve to the lungs."[2]

## ANESTHESIA: THE CARE OF WOUNDS

Ether, nitrous oxide and chloroform had all been discovered and used extensively prior to the War Between the States. Chloroform had been used 25,000 times previously in the Crimean War with no unfavorable results, and was the anesthetic agent of choice in the War Between the States. Dr. Hunter McGuire, Medical Director of Jackson's Corps, collected 15,000 cases of chloroform anesthesia during the war without a single death.[5] Although the blockade of the Southern states was most effective, chloroform, quinine, and morphine were never completely lacking in the Confederacy during the war.

Preoperatively, the patient was given a light, nutritious meal in the hope that the stomach would then be empty and the patient strong. Brandy was the premedication of choice. The patient was placed in the supine position, and chloroform was poured upon a

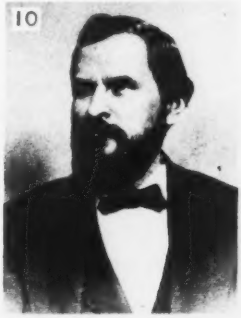


*Figure 8. While the North was experiencing growing pains in its Medical Corps and was commanded successively by four Surgeons-General, the South was blessed with an incredibly astute and efficient Surgeon-General in the person of Samuel Preston Moore of Charleston. Moore had been a surgeon in the "old army" but had resigned to join the Confederacy. Although there were several "paper" Surgeons-General serving initially for several weeks, Moore organized an astonishingly effective Medical Corps in a South that had no surgical instrument makers, no textbooks of surgery, no manufacturers of prostheses, and no drug houses.*

*Figure 9. James Brown McCaw, M.D., a youthful professor of chemistry and pharmacology at the Medical College of Virginia, was given the task of building and administrating the Chimboraza Hospital in the hospital center of Richmond. McCaw was editor of the Confederate States Medical and Surgical Journal, as well, and during this period of intense activity six scientific articles appeared in this journal from the staff of his own Chimboraza Hospital.*

*Figure 10. J. J. Chisolm, M.D., wrote one of the two badly-needed textbooks on surgery used by the Confederate Medical Corps. His* A Manual of Military Surgery *promulgated rules of field sanitation as well as principles of operative treatment of traumatic wounds.*

cloth cone. The anesthetist and the assistant were completely silent during the induction. Corneal reflexes were tested to determine complete anesthesia of the patient. The pulse, respirations, and color of the patient were scrutinized closely. If the airway became obstructed, the tongue was seized (by a hook, tenaculum, forceps or fingers) and was brought forward.[6]

*Asepsis.* Antisepsis and asepsis were not understood at the time of the War Between the States, as the discoveries of Lister came, ironically, in 1865, as the war ended. Instruments were always unsterile, and wounds were cleaned with an unclean sponge which was used indiscriminately in all cases. So common was the appearance of suppuration or "laudable pus" upon the fourth day that its appearance was thought wrongly to herald the

progress of a wound which was healing normally, always by secondary intention.

*Minie balls*. A large portion of the injuries of battle were brutal wounds caused by the Minie ball, a conical rifle bullet named for its inventor, Captain C. E. Minie of France.[9] The low velocity of the Minie ball accounted for its destructive qualities, which produced most injurious wounds. With low velocity, the conical ball would turn in its course, causing a bursting type of wound of exit. These wounds were much more severe than those caused by bullets of higher velocity which passed completely through the soft parts and bones without turning broadside.

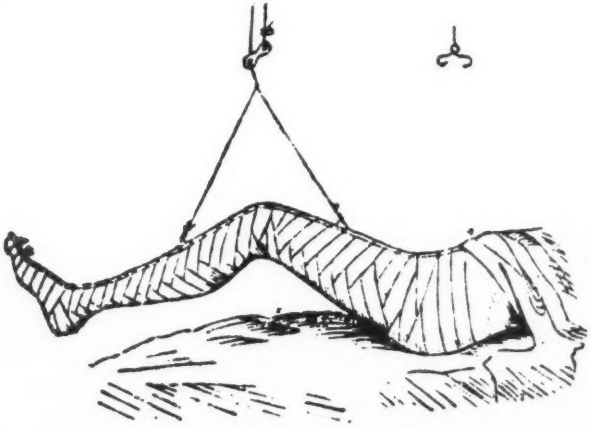

*Figure 11. Of the soldiers who were wounded and reached hospitals, 70 per cent received wounds of the extremities. From experience gained earlier in the Crimean War, it was known that, in the pre-Lister days of the Civil War, one's chances of recovering from a fracture of a long bone were greater if the limb were amputated. Dissatisfaction grew over what was considered by many surgeons as an unnecessary amputation of limbs. James Bolton, M.D., devised a form of extramedullary fixation which anticipated the present Roger-Anderson apparatus, and Professor Nathan R. Smith of Baltimore devised a conservative form of therapy consisting of an anterior wire splint (shown above) which was suspended from an overhead frame.*

Treatment of the ordinary wound of battle consisted of shaving the part, sponging it with warm water, probing the wound, and removing foreign bodies, which, it was hoped, would include the missile. The wounds were dressed with lint, the scrapings from cotton. Wet dressings were applied often, using cotton dipped in cold water. These were used routinely in large wounds, amputations, resections, and extensive lacerations. The wet dressings were used in three different ways: by direct application, by ap-

plication which was sealed so as to prevent the evaporation and to exclude air, and by cold water which was dripped onto the wound.[10] Flaxseed or bread poultices were employed often. Raw cotton, baked or charred in the oven, was used also for dressings and hence was rendered relatively aseptic by this method of treatment. Cotton, flax thread, silk, and horsehair were used as ligatures. The horsehair was boiled to make it more pliable and soft, and thus, accidentally, was rendered sterile.

*The treatment of hemorrhage.* Hemorrhage was a major problem of the wounded of the War Between the States. "Three-fourths of those who died in battle perish from hemorrhage."[6] It was stated, "No class of operations demands a more accurate knowledge of anatomy than those upon the arteries: no class in which perfect equanimity is so important to the surgeon: and no class, the attendance of which are more calculated to alarm, disconcert and confuse."[6] Hemorrhage itself was divided into primary and secondary hemorrhage.

Secondary hemorrhage was subdivided into several types: *"retarded hemorrhage"* (eight to ten hours following injury—it was stated that following the engagements around Richmond, in the Peninsular campaign, a very large number of the wounds began to bleed freely after the patient arrived at the hospital); *"intermediate hemorrhage"* (three to five days following injury without any antecedent hemorrhage), and *"consecutive hemorrhage"* (eight to fifteen days following surgery when the separation of slough opened a vessel injured previously or softened by the process of necrosis).

The treatment of hemorrhage was divided into provisional means and operative means. Provisional or conservative means consisted of pressure, elevation, and application of sedation, cold, and local styptics. Pressure was exerted either by hand or by the application of a tourniquet over the course of the main artery proximal to the injury, with the object of flattening the vessel and of obliterating its lumen. Styptics of persulphate and perchloride of iron (Monsel's solution) were used. No operative intervention was performed unless the vessel had bled, as injury per se, without external bleeding, was not an indication for operation. Secondary operation was performed only at the site of injury, when both ends of the severed vessel were ligated.

*The care of wounds of the extremities.* Seventy per cent of those who lived to reach a hospital had wounds of the extremities. From experience in the Crimean War, it was well known to all Confederate surgeons that a gunshot wound into any joint or a gunshot fracture of the femur was nearly always fatal if *not* operated upon. Statistics from the Crimean campaign showed that *only* 19 of 194 patients (10 per cent) with compound fractures of the femur recovered if the limb were left untreated. However, when amputation

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was resorted to, 12 per cent recovered from fractures of the proximal third of the femur, 40 per cent recovered from fractures of the middle third, and 43 per cent recovered from fractures of the distal third. Consequently, early in the war, the rule was established of amputating the extremity if it were injured seriously, for it was thought that primary operation gave the best chance for recovery. Because of this surgical premise, thousands of limbs were sacrificed that could have been saved at the present time. In fractures of the upper third of the femur, the dangers attending amputation were so great that it was questionable whether amputation was indicated. In gunshot wounds of the upper extremity, as much of the hand as possible was preserved if amputation were resorted to.[6] It was suggested by J. S. Wilson[11] that resection of the proximal segment of the humerus be performed following fracture, thus allowing the muscles of the upper arm to function in an unimpaired manner, although reducing the arm to a mere flail.

"In standard methods of amputation, the integument is divided by circular, elliptical, or hemi-elliptical incisions: or by a combination of the first and last forms."[6] If the amputation were performed using only the knife, it was spoken of as having been performed "in contiguity". If section demanded the use of the saw or bone-biting forceps, it was said to have been performed "in continuity."[6]

James Bolton wrote during the War Between the States of the unnecessary loss of extremities, stating that amputation was only an exchange of death by exhaustion for death by shock. "If the limb be saved, it will almost certainly be shortened, and frequently misshapen; and this may happen to such an extent that the limb may be an incumbrance." As a result of his dilemma, Bolton[12] devised an ingenious form of extramedullary fixation in 1864. Through two stab wounds in the soft tissues, holes were drilled in the cortex of the long bone. Rods were screwed into these holes. A longitudinal rod was then passed at right angles through the two upright rods outside the integument, parallel to the shaft of the bone. This method was the antecedent of the present-day Roger-Anderson apparatus.

An ingenious method of splinting was devised by Professor Nathan R. Smith, of Baltimore,[13] consisting of bandaging the limb to an anterior wire splint and suspending the extremity from an overhead frame. The splint was made of wire and easily applied.

Statistics upon amputations reported in 1864 in the Confederate States Medical and Surgical Journal stated that there was a mortality from 1814 operations for amputation, resection, and disarticulation of 34 per cent. There was a mortality from primary amputation for fracture of the femur of 38 per cent, and a mortality of 73 per cent from secondary amputation. In amputation of the leg, there was an attendant mortality of 30 per cent for primary amputations and 49 per cent in secondary amputations. In ampu-

tations of the upper arm, there was a 14 per cent mortality for primary amputations and 37 per cent for secondary amputations; primary amputation of the forearm carried with it a 12 per cent mortality and a secondary amputation a mortality of 22 per cent.

By 1864, there were nearly 10,000 amputees in the Confederate States Army. Although artificial limbs were being manufactured

*Figure 12. Because of the dearth of textbooks upon medicine in the Confederacy, Surgeon-General Moore published the "Confederate States Medical and Surgical Journal." This excellent journal was issued monthly for fourteen numbers, until March of 1865. Only two libraries in this country possess all fourteen issues of this journal.*

at that time for lower extremity amputees, the manufacturers could supply only one-tenth of the demand. Ideally, amputation stumps were left long enough to secure abundant leverage, were well covered with soft tissues, and were shaped like a truncated cone. The socket of the artificial limb was well padded and was fitted to the stump so that every portion of its periphery was in contact except the tip of the stump. "Artificial limbs resemble those of the resecta except that the *skeleton is without*. Their structure generally is of wood, covered with leather, but sometimes of a heavy wire cloth. Strong and well-secured joints at points corresponding with those in the host's limb, move with ease and exactness through the medium of cords, levers and springs of metal or guttapercha, the whole being, in symmetry and function, a faithful representation of the natural leg, with the exception that the artificial leg, being but the work of man, is a more simple apparatus."[14]

*The care of abdominal and chest wounds.* Approximately 20 per cent of the wounds incurred were of the torso. Abdominal wounds which perforated a hollow viscus were almost uniformly fatal. Although the pathologic physiology of sucking wounds of the chest was imperfectly understood, Assistant Surgeon Howard, of the United States Army, publishing in the New York Medical Times, suggested that gunshot wounds of the chest be treated by sealing hermetically the wounds of entrance and exit, thus preventing the additional entry of air into the pleural cavity which would collapse the lung.[15, 16]

*The care of wounds of the head and neck.* Ten per cent of the wounds of battle were of the head and neck. It was known during the time of the War Between the States that the great vascularity of the structures of the face promoted healing, and that bony fragments attached by periosteum would survive. Hence, debridement of bony spicules in the face was reduced to a minimum. It was known, also, that because of the vascularity of the face, serious hemorrhage might accompany all injuries in that area.

Fractures of the mandible were treated early in the war with a pasteboard splint designed by S. H. Stout, Medical Director of the Army of Tennessee. The problem of oral secretions was troublesome, although positioning of the patient was recognized to be important. It was felt that swabbing the mouth frequently was an advantageous procedure.

Stout, who was in charge of hospitals in Tennessee, utilized the services of Dr. J. B. Bean, a Chattanooga contract dentist who advocated splinting by intermaxillary wiring. Dr. Bean suffered from "chronic rheumatism" and hence was not upon active duty. Both Stout and Dr. Westmoreland, professor of surgery at the medical college in Atlanta, availed themselves of Dr. Bean's skill in the treatment of gunshot fractures of the mandible. It was never possible for Dr. Stout to place a dentist in every hospital, however, a number of civilian contract dentists were employed, as Dr. Bean had been, and funds were made available for them to work upon the problem of jaw fractures. Dr. Stout stated, "The result of their [Dr. Westmoreland's and Dr. Bean's] joint labors was so satisfactory, so perfect in its adaptation to the treatment of gunshot fractures of the lower jaw, that it had never before been equalled in the securing of comfortable articulation of the subject of the fracture while under treatment.... While inspecting the hospital, Dr. Westmoreland introduced me into what he called his 'broken jaw ward,' where I was greeted with great hilarity by the patients, who were able to converse freely and distinctly with me."[17]

It was recognized that wounds of the face were often more distressing than dangerous, because of the deformity that they caused. The larynx and trachea were injured often and, although trache-

otomy was resorted to in cases of diphtheria, it was not used in cases of traumatic airway obstruction by the Confederate States Medical Corps.

It was known that because of the rich vascular supply, injuries to this region were often followed by dangerous primary or secondary hemorrhage. For hemorrhage of an exsanguinating type, pressure and powerful iron styptics were advocated. It was stated, "We find, after every great battle, the neck perforated by balls in every direction, accompanied by violent hemorrhage; yet, with the first fainting brought on from shock and loss of blood, we find a spontaneous cessation of bleeding, and the onward progress of the case becomes one of continued convalescence to perfect cicatrization."[2] McLeod reported on 128 cases with from slight to severe injuries of the neck, with but four deaths.[2]

Severe hemorrhage was treated by ligation of both ends of the severed bleeding vessel. Enlargement of the wound was accomplished parallel to the long axis of the neck to avoid injuring important nerves or blood vessels.[2]

It was known that if one carotid artery were ligated, cerebral disturbance occurred in one-fifth of the cases and in half of these (one-tenth of cases) the outcome was fatal. When both carotids were ligated simultaneously, death always ensued. If the two carotids were ligated several days or weeks apart, there was no greater incidence of cerebral disturbance than when one carotid alone was tied.

## HOSPITALS IN THE CONFEDERATE STATES

Richmond became a vast collection of hospitals during the war just as did Washington and Alexandria in the North. There were twenty-seven numbered hospitals in Richmond, and over fifteen named hospitals.

Many of the casualties were nursed in private homes by the ladies of the Confederacy. The total amount of care rendered or the number of cases treated will never be known. Not only were the wounds of the Confederate soldiers cared for, *but* their wants in clothing and food were satisfied as well. "A soldier taken into a private home often went forth after his convalescence wearing a beautifully patched uniform and underwear made from the linen of the women, who sacrificed their own clothes and comfort for the benefit of the men at the front."[5] Numerous female philanthropists aided the Southern hospital cause. In Nashville, Mrs. Felician Grundy Porter worked unceasingly to establish hospitals for the wounded. As president of the Women's Relief Society of the Confederate States, she arranged concerts and tableaux and so collected vast sums of money for the purpose of establishing hospitals and buying artificial limbs for Confederate amputees.[5]

Another heroic Confederate woman was Sally B. Tompkins, who expended most of her ample resources establishing and maintaining the Robertson Hospital in Richmond. This hospital was operated with a high degree of efficiency and established an enviable record, admitting 1333 patients of whom only 73 died. Soon after the war began, an executive order was issued which placed all private hospitals under Government control. Because it was feared that such an order would cause the Robertson Hospital to

*Figure 13. To supply surgical instruments, needed so desperately, the South maintained purchasing agents in Nassau and in London. Instrument sets like the above were the work of English manufacturers, and were run through the blockade. Ironically, the North proved to be a good source of supply for medical material as, in the early part of the war, the superior cavalry of the South obtained large caches of equipment and drugs from raids on Northern wagon trains*—(From the Authors' Collection).

lose its benefactor, President Davis commissioned Miss Sally B. Tompkins a captain in the Confederate States Army. Sally Tompkins accepted this commission, but refused to place herself upon the payroll of the Confederate States. The commission given to Captain Tompkins was the *only one* granted to a woman by the Confederate States Army.

The most famous Confederate hospital was the Chimboraza Hospital of Richmond, with 8400 beds. During its three years of operation, it treated 76,000 patients, of whom 17,000 were battle

casualties, with an over-all mortality of approximately 9 per cent. Shortly after the first battle of Bull Run, before the Peninsular Campaign, the Surgeon-General commissioned Dr. James Brown McCaw, of Richmond, to establish and direct this hospital. Still in his thirties, McCaw already had been editor of the Virginia Medical and Surgical Journal for years, and was professor of chemistry and pharmacology at the Medical College of Virginia. McCaw organized his huge hospital into five divisions according to states. This hospital encompassed 150 buildings and 100 Sibley tents (of the tepee type). McCaw showed his genius for administration by buying several large tobacco warehouses in near proximity to the hospital, which he utilized for the manufacture of soap. The well-seasoned lumber used for tobacco boxes, obtained by this purchase, was utilized to build bedsteads, furnishings, and partitions. McCaw used the factory hands for manual labor. Further construction included large icehouses, a Russian bathhouse, a sewage disposal unit, and a bakery. Water wells were dug. A brewery was established with a capacity of 400 kegs of beer to a brew. McCaw maintained large herds of cows and goats, and to procure fresh vegetables, several canal boats plied the James River Valley purchasing fresh vegetables for the patients. The total staff numbered 120, of whom 40 to 50 comprised the medical staff.

During this period of intense activity, McCaw found time to serve as editor of the "Confederate States Medical and Surgical Journal", and within the fourteen numbers of the journal, six scientific reports appeared from the staff of his own Chimboraza Hospital.

## BENEFITS FOR CONFEDERATE VETERANS FOLLOWING THE WAR BETWEEN THE STATES

Following the war, most of the Confederate States recognized their obligation to assist the disabled and destitute war veterans, and the most generous states, which led in veterans' services, were Louisiana, Georgia, Florida, and Virginia. Considerable sums of money were appropriated to furnish artificial limbs to indigent amputees. In 1866, the state of Georgia appropriated $30,000 for this purpose, and $20,000 was appropriated by the Florida legislature in 1886. A pay scale for disability considered generous at that time (the state of Florida) consisted of annual payments of $150 for loss of sight or of both hands or feet, $30 for loss of one eye or loss of hearing. Artificial legs costing about $80 were purchased for amputees, and $25 was provided for repair of a prosthetic extremity.

This, then, is a short chronicle of a small valiant corps that labored, though unprepared and undersupplied, to aid 3,000,000 sick and wounded in the last of the romantic wars in which the individual was yet a major factor. Individual performances ranked

high, and the figures of mortality and morbidity compared favorably with those of the adversary. In lieu of official documents, however, the final history of the Medical Corps of the Confederate States Army must wait to be written when personal documents are released by families to the great libraries. Then more able scholars than we will make their appraisals.

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### VICTORY OF NATURE

It falls to the lot of few men to appreciate properly the effect of various modes of treatment in a particular disease; for if a patient recovers, whatever was the treatment, whether good or bad, we flatter ourselves it was the effect of our superior merit in conducting the disease; but future experience may convince us that the recovery, of which we so vainly boasted, was a victory of Nature over the malpractice of art.—Edward Kentish: *An Essay on Burns,* 1797.

# Clinicopathologic Conference

U. S. Naval Medical School, Bethesda, Md.*
U. S. Naval Hospital, Bethesda, Md.**

## HYPERTENSION AND WEIGHT LOSS IN CHILDHOOD

**Summary of Clinical History.** An 8-year-old white girl was admitted to the U. S. Naval Hospital, Charleston, S. C., on 11 September 1955 with the chief complaint of 14-lb weight loss during the prior 3 months, and paroxysmal spells of headache and sweating. She had always been underweight (below the third percentile), and was never very active. She tired easily, required food at night, drank a large amount of water, and used salt excessively. She always perspired easily. Routine examination one year prior to admission revealed proteinuria; blood pressure was not taken, and no follow-up was made.

### FIRST HOSPITALIZATION

**Physical Examination.** On admission to the U. S. Naval Hospital, Charleston, S. C., the child weighed 32 pounds. Her pulse rate was 144 per minute and her blood pressure was 196/170 mm Hg (right and left arms). She was poorly developed, poorly nourished, markedly cachetic, pale, and appeared to be chronically and severely ill. She was active and alert. Her pupils were moderately dilated, and both fundi showed 4-plus papilledema, narrowing of arterioles with spasm, flame-shaped hemorrhages, and whitish exudate. The teeth were carious. The heart was slightly enlarged to the left, and the apical impulse was forceful.

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*Capt. Calvin B. Galloway, MC, USN, Commanding Officer; Capt. Vernon E. Martens, MC, USN, Director of Laboratories. From the Department of Anatomic Pathology, Comdr. Robert M. Dimmette, MC, USN, Chief.

**At the time of this conference, Rear Adm. Edward C. Kenney, MC, USN, was Commanding Officer. From the Department of Pediatrics, Capt. Thomas E. Cone, Jr., MC. USN, Chief.

A grade I to II systolic apical murmur was heard. The remainder of the physical examination was within normal limits.

**Laboratory Studies.** The red blood cell count was 3,900,000 per $\mu$l; hemoglobin, 11 grams per 100 ml; hematocrit, 44 ml per 100 ml; sedimentation rate, 43 mm per hour (corrected). The white blood cell count was normal. The urine was pale, showed a specific gravity of 1.004, was negative for sugar, and contained 300 mg albumin per 100 ml. Blood urea nitrogen was 10 mg per 100 ml. Fasting blood sugar was 100 mg per 100 ml. Total protein was 8.9 (albumin 4.05, globulin 4.85) grams per 100 ml. Chlorides were 550 mg per 100 ml. Carbon dioxide was 51 volumes per cent. An electrocardiogram showed sinus tachycardia with early left ventricular hypertrophy. Roentgenograms of the skull, chest, and abdomen were normal. The basal metabolic rate was plus 31. An intravenous pyelogram showed a questionable downward displacement of the right kidney.

**Course in Hospital.** The patient's blood pressure ranged from 200 to 280 systolic, and 170 to 230 diastolic. Her pulse rate usually remained at 144 per minute. On 19 September 1955, without prior antihypertensives or sedatives, 3 mg of Regitine (brand of phentolamine hydrochloride) was given intramuscularly with the following results: maximum drop in blood pressure in 9 minutes to 130/110 mm Hg from a control of 240/190; blood pressure returned to 230/190 mm Hg in 74 minutes. (A positive test is considered a drop of at least 30 systolic/20 diastolic.) On 19 September 1955 the patient was transferred to the U. S. Naval Hospital, Bethesda, Md.

## SECOND HOSPITALIZATION

**Physical Examination and Laboratory Studies.** Upon admission to this hospital, on 20 September 1955, the physical examination findings were the same as those found during the patient's first hospitalization, except that the patient now showed moderate dehydration. Her blood pressure was 230/180 mm Hg. An intravenous Regitine (brand of phentolamine) test showed a drop in blood pressure to 0/0 in 30 seconds, and the patient went into opisthotonos and became unconscious. The blood pressure returned to pretest levels in 30 minutes. Blood urea nitrogen was 42 mg per 100 ml. Total protein was 6.6 (albumin 4, globulin 2.6) grams per 100 ml. The white blood cell count was 11,900 per $\mu$l, with 10 per cent band forms, 56 per cent neutrophils, 18 per cent lymphocytes, and 16 per cent monocytes. The red blood cells numbered 2,900,000 per $\mu$l, and the hemoglobin was 11 grams per 100 ml. A roentgenogram of the chest was read as normal, except for a rounded, 2.5- by 3-cm, paravertebral mass in the right side of the chest in the region of the seventh and eighth thoracic vertebrae, believed to be a tortuous aorta.

**Course in Hospital.** On 22 September the catechol amine levels were reported as 61 $\mu$g of norepinephrine per liter of plasma,

with no epinephrine demonstrated. (Normal values are: 1.1 to 5.5 μg for norepinephrine and 0.0 to 1.5 μg for epinephrine per liter of plasma.)

On the second day, the patient began to vomit and passed a large, bloody, tarry stool. The vomitus was not bloody. The red blood cell count was 2,790,000 per μl and the hemoglobin was below 7.5 grams per 100 ml. Platelets numbered 325,000. She was given a blood transfusion of 300 ml. Later three more tarry stools were passed and a second unit of blood was started. Her blood pressure remained around 220/190 mm Hg and her pulse was 140. Late on 22 September hemoglobin was 14 grams per 100 ml and the hematocrit was 44 ml per 100 ml. At 1900 a dilute Regitine drip was begun (5 mg per 1,000 ml) with the blood pressure stabilizing at 190/160 mm Hg, and the child was taken to the operating room.

## DISCUSSION

**Doctor Dimmette:** Doctor Pearson, will you discuss this case?

**Doctor Pearson:*** This child presented the history and findings of severe, progressive malignant hypertension. Hypertension is an uncommon finding in pediatric practice; but before discussing the differential diagnosis of this sign, I should like to emphasize two points: First, blood pressure varies with the age of the patient. Up to age 4 the average blood pressure is 85/60 mm Hg; at age 8 it averages 95/62; and at age 12 averages 108/67. Second, in determining the blood pressure, the sphygmomanometer cuff should cover about two thirds of the extremity being measured. Cuffs that are too narrow will give falsely high values.

Perhaps the most common cause of transient hypertension in childhood is the functional type seen in excited, struggling children. Fear and apprehension may raise the systolic blood pressure as much as 40 to 50 mm Hg above the usual level. Repetition of the determination and, if necessary, sedation can establish hypertension of this type.

Renal disease is a common cause of juvenile hypertension. Acute hemorrhagic glomerulonephritis is a disease which follows beta hemolytic streptococcal infections or, occasionally, an impetiginous staphylococcal infection. Hypertension is seen in 60 to 70 per cent of these cases and may be accompanied by hypertensive encephalopathy. The findings of sudden gross hematuria, albuminuria, periorbital edema, and fever in a child with a history of recent sore throat is characteristic of this disease. In children, prognosis in acute glomerulonephritis is excellent. In less than 5 per cent of cases is there a progression into the chronic state. Chronic relapsing glomerulonephritis is rare in childhood, but is marked by progressively deteriorating renal function along with consistent albuminuria, hematuria, and abnormal Addis counts.

*Lt. Howard A. Pearson, MC, USN, Resident in Pediatrics.

Pyelonephritis is common in pediatric practice. Anomalies in the genitourinary tract are found in about 10 per cent of autopsy cases in children. Obstruction secondary to congenital strictures, valves, vessels, and malpositions predispose to retrograde infection of the kidneys. Chronic destruction of the renal parenchyma may lead to hypertension.

Polycystic kidneys may manifest themselves at an early age with hypertension and azotemia. Urographic demonstration of the so-called "spider pelvis" is characteristic.

Ischemia of the kidney due to renal arterial obstruction or unilateral renal hypoplasia may produce the Goldblatt phenomenon with liberation of pressor substances from the ischemic kidney, and severe hypertension may result.

The diagnosis of nephrogenic hypertension usually can be established by careful history, a thorough examination of the urine, and appropriate blood chemistry and urographic studies.

Another relatively common cause of hypertension in childhood is coarctation of the aorta. The findings of an upper extremity hypertension exceeding the blood pressure of the legs by at least 20 mm of mercury is pathognomonic. Palpation of the femoral pulsation should be part of every physical examination, and any person with hypertension should have the blood pressure in his legs measured.

The aforementioned clinical entities account for the vast majority of the cases of hypertension in childhood. However, hypertension may be seen as part of the clinical pictures in several other diseases. It may accompany expanding intracranial lesions, but the signs and symptoms of increased intracranial pressure overshadow the hypertension. It is seen more or less regularly in certain endocrinopathies. Cushing's syndrome is occasionally reported in children and is usually accompanied by hypertension. A few cases of the adrenogenital syndrome may have associated hypertension. Along with the other manifestations of the syndrome, this responds dramatically to cortisone therapy. These two states have other features, such as precocious puberty in childhood or virilism in the female adult, which make these diagnoses clear. One per cent of cases of hyperthyroidism occur in children, and elevated blood pressure is seen in these cases. However, a goiter and exophthalmos generally characterize this disease in children.

Moderate hypertension is part of the picture of lead poisoning. A history of pica, together with constipation, anemia, stippled red cells, suggests the diagnosis. Elevated serum and urine lead levels establish the diagnosis.

Erythredema polyneuropathy or pink disease due to acute idiosyncrasy to mercury is accompanied by significant hypertension. The clinical picture is characteristic—the child is extremely irritable and has an intensely pruritic, red, desquamative eruption of the hands and feet. Urine mercury levels are increased.

Polyarteritis nodosa may occur during childhood. Along with protean signs and symptoms of multiple system and organ involvement, an elevated blood pressure may be seen. The urine usually contains blood and albumin, and azotemia is frequent.

Seventy-five per cent of cases of hypertension in adults are classified as essential or idiopathic. This syndrome is extremely uncommon in childhood. It is a diagnosis made by exclusion, but authentic cases have been reported. The disease is usually rather rapidly progressive, and a fatal termination is the rule.

One recently described syndrome deserves particular mention at this point. This is familial autonomic dysfunction or the Riley-Day syndrome, a bizzare congenital defect seen usually in children of Jewish extraction. The common features are absent lacrimation; drooling; excessive perspiration; sharply demarcated, episodic skin blotchings, in-co-ordination and relative insensibility to pain. Some of these patients have paroxysmal hypertension, and several instances have been reported in which a patient was erroneously subjected to an exploratory operation for a pheochromocytoma.

Lastly we come to what the patient under discussion today probably has, *i. e.*, pheochromocytoma or a functionally active tumor of chromaffin tissue.

This child undoubtedly had a tumor for a long time—at least one year—if her proteinuria and poor development may be considered pertinent. If after appropriate chemical and urographic data in a given case, there is still a possibility of pheochromocytoma, two physiologic approaches might be considered in establishing the diagnosis. First, adrenalin antagonists—the so-called adrenolytic agents—might be used to cancel out the pressor effects of the circulating catechol amines and cause a drop in blood pressure. This is the basis of the Regitine or bezodioxane tests. However, if there is significant azotemia or if sedative or antihypertensive drugs have been used recently, false positives may be encountered. The drop in blood pressure may be very transient. Finally, as seen in this case, a pharmacologic test may have a severe, profound, hypotensive effect on the patient. The second approach in diagnosing a pheochromocytoma is to measure directly the levels of the pressor substances producing the pathophysiologic disturbances. This would appear to be the ideal method.

During the three months before admission to the hospital, the patient developed malignant hypertension with generalized arteriolar disease secondary to prolonged effect of circulating epinephrine-like compounds.

In conclusion of this discussion I should like to point out that only if the blood pressure is determined can the many curable types of hypertension in childhood be treated.

**Dr. Pearson's diagnosis:**
Pheochromocytoma of the adrenal gland

**Doctor Dimmette:** Is there any discussion from the floor? If there is no further discussion, I should like to continue with this child's course in the hospital. After the Regitine drip was established and the blood pressure became stabilized, she was taken to the operating room.

A subcostal incision was made from the right anterior axillary line across the abdomen to about the left midclavicular line. Preliminary exploration revealed no gross palpable abnormality except with reference to the superior pole of the right kidney. The superior pole of the kidney was covered by a firm, rounded, tumor mass, apparently extending from the substance of the right adrenal gland. This tumor mass was firmly fixed in position. It seemed to extend past the midline over the bodies of the spine between the aorta and the vena cava. The inferior surface of the right adrenal and its contained tumor mass was freed from the superior pole of the kidney with numerous blood vessels being divided and ligated. With some difficulty the posterior aspect of the gland and the tumor mass was removed from the right paravertebral fossa where it was adherent densely. The tumor mass was then dissected off the right anterolateral aspect of the aorta, where again it was densely adherent. As this dissection proceeded laterally, a very short arterial trunk was of necessity divided close to the aorta. When the main blood vessels were divided there was a sudden drop in blood pressure. The small intestine was then carefully inspected, and an area, about 12 inches in length, located in the mid-ileal area, showed marked hemorrhagic discoloration. Active peristalsis, however, was seen to progress across this segment of small bowel. At this point the patient's condition appeared critical, the pulse rate being 190 per minute and the blood pressure 100/70 mm Hg, it was believed best not to resect the involved small intestine, because it probably was viable. Closure was then made. During the course of the operation Regitine was administered intravenously and discontinued upon removal of the tumor. At this point intravenous administration of norepinephrine was begun to maintain blood pressure.

At 0315 on 23 September, the patient's blood pressure was stabilizing at about 160/140 mm Hg, and the pulse rate was 180 per minute. At 0930 her temperature was 104.2°F; pulse rate, 160 per minute; and her blood pressure was 160/140 mm Hg. The chest was clear. The abdomen was slightly distended with absent peristalsis. The white blood cell count was 21,450 per $\mu$l, with 43 per cent band forms, 25 per cent neutrophils, 18 per cent lymphocytes, 14 per cent monocytes, and 2-plus toxic granulation. The hemoglobin was 13.5 grams per 100 ml. Chlorides were 95 mEq per liter.

On the second postoperative day the patient had abdominal pain and upper abdominal distention, and she began to vomit coffee-ground material. Active peristalsis was heard. Her temperature was 99.8°F. Her blood pressure was stable at 160/100 mm Hg.

On the second postoperative day she appeared to be improving. On the third postoperative day she commenced taking fluids by mouth without difficulty. Peristalsis was active and urinary output was good. The urine was alkaline, specific gravity was 1.013, and albumin

was 10 mg per 100 ml. The white blood cell count was 19,400 per $\mu$l, with 19 per cent band forms, 71 per cent neutrophils, 4 per cent lymphocytes, 5 per cent monocytes, and 1 per cent eosinophils with 3-plus toxic granulation. Hemoglobin was 10.5 grams per 100 ml. Serum sodium was 155 mEq per liter; serum potassium, 2.6 mEq per liter; nonprotein nitrogen, 55 mg per 100 ml; and total protein, 4.8 grams per 100 ml.

On the fifth postoperative day the patient's temperature was 100.8°F; blood pressure, 150/100-110 mm Hg; and pulse rate, 95 to 105 per minute. She was having spontaneous bowel movements. Her stools were positive for blood. The incision was clean. She began to refuse fluids (less than 500 ml orally). At 1830 she vomited a dark-brown liquid, which was positive for occult blood.

On the sixth postoperative day, the patient's abdomen was distended and she was regurgitating large amounts of clear, bile-stained fluid. Peristalsis was markedly decreased. A Miller-Abbott tube was inserted. The red blood cells numbered 4,020,000 per $\mu$l, and the hemoglobin was 13 grams per 100 ml. Serum sodium was 133 mEq; potassium, 7 mEq; chlorides, 84 mEq; all per liter. At 1900 the serum potassium was 4.6 mEq per liter and carbon dioxide was 34.8 millimols per liter.

Early in the morning of the seventh postoperative day the patient's blood pressure dropped from 150/90 to 80/60 mm Hg, and her pulse rate rose from 140 to 180 per minute. She was given Levophed in 100 ml of 5 per cent dextrose in saline. At 0755 she appeared better, but her blood pressure still was 88/70 mm Hg; carbon dioxide was 37 millimols per liter; serum sodium, 140 mEq per liter; potassium, 3.2 mEq per liter; and blood urea nitrogen, 17 mg per 100 ml. The white blood cells numbered 34,300 per $\mu$l, with 2 per cent metamyelocytes, 38 per cent band forms, 53 per cent neutrophils, 6 per cent lymphocytes, 1 per cent monocytes, with 4-plus toxic granulation. Red blood cells numbered 2,340,000 per $\mu$l, and hemoglobin was 8.5 grams per 100 ml.

On the eighth postoperative day the patient's condition was essentially the same. Her blood pressure was 150-110/80-100 mm Hg; pulse rate, 120 to 130 per minute; respirations, 20. Her chest was clear. Her abdomen was distended over the cecal area; peristalsis was slight. Blood chemistry studies showed the following: serum sodium, 144 mEq; potassium, 3.0 mEq; chlorides, 91 mEq; and carbon dioxide, 34 millimols; all per liter.

Early in the morning of the ninth postoperative day while a cutdown was being performed, the patient's blood pressure dropped to 56/30 mm Hg and her respirations became deep and sighing. Within two minutes respirations and cardiac action ceased, and the patient was pronounced dead at 0015.

**Doctor Dimmette:** Dr. Hartney will present the pathologic findings in this case.

## PATHOLOGIC FINDINGS

**Doctor Hartney:*** At autopsy the body of this 8-year-old emaciated white girl measured 49 inches, crown-heel, and weighed 30½ lb. A recent surgical incision, closed with interrupted black silk sutures, extended across the hypochrondrium; it measured 22 cm in length.

The brain weighed 1,160 grams. The sulci were narrow and the gyri were flattened. The vertebral, basilar, and internal carotid arteries, as also the circle of Willis, were thick-walled. Meninges, pituitary, sella turcica, and cranial nerves were grossly normal.

A pale yellow-white, firm nodule, 5.5 cm in diameter, was present paravertebrally in the right side of the thoracic cavity between the 7th and 8th thoracic vertebrae; the over-lying lung was adherent to it. The heart weighed 140 grams. The left ventricle was dilated and its wall was 3.0 cm in thickness. The right ventricular musculature was 0.4 cm in thickness. Circumferences of the valves were as follows: tricuspid, 5.8 cm; pulmonary, 4.0 cm; mitral, 4.3 cm; and aortic, 4.5 cm. The posterior leaf of the mitral valve bore an atheromatous plaque which extended from mid-leaf to the free edge. The thoracic aorta was thickened markedly. It contained many creamy-yellow plaques throughout its length. The right lung weighed 230 grams, the left 190 grams. Both lungs exhibited dependent congestion; purple-red blood oozed from the cut section of the dependent portions. The tracheal-bronchial tree, pulmonary vessels, and hilar lymph nodes were without gross abnormality.

The thymus was rudimentary. Thyroid, parathyroids, and larynx were grossly normal.

The abdominal surgical incision exhibited no areas of dehiscence. A fecal odor was encountered when the peritoneum was incised. Fibrinous, grayish, yellow-green exudate was present throughout the peritoneal cavity. The omentum was adherent to the small bowel, whose loops were adherent to one another. The liver weighed 790 grams. The peritoneal surface was covered with grayish-green, fibrinous exudate. The gallbladder was normal, with the exception of peritonitis, and on compression of it, greenish-black bile flowed through the ampulla of Vater. The pancreas exhibited no gross abnormalities. The spleen weighed 30 grams. It exhibited peritonitis, but no other gross abnormality.

The esophagus and stomach were grossly normal. The mucosa of the duodenum was bile-stained. The jejunum was dilated. The ileum exhibited an area of perforation, 0.8 cm in diameter, located approximately 5 feet proximal to the cecum. From a point 12 cm proximal to the perforation, and continuing to the cecum, the wall of the ileum was thickened and friable, with its serosa mottled reddish brown and its mucosa hemorrhagic. The adjacent mesentery was thickened and friable and mottled dusky-red, with a fairly sharp line of demarcation

*Lt. Thomas C. Hartney, MC, USN, Resident in Pathology.

evident at proximal and distal borders of the involved area. The serosal surface of the bowel, from stomach to rectum, was covered with varying amounts of fibrinous, dark greenish-yellow exudate. Frank thrombosis of branches of the superior mesenteric artery were not demonstrated.

The right adrenal gland was absent, and its bed contained a small amount of reddish-brown granular material. Adjacent tissues were ecchymotic. The left adrenal was irregularly pyramidal in shape and contained a nodule of pale yellowish-gray tissue measuring 1.1 cm in diameter. It was poorly demarcated from the adjacent tissue and contained areas of reddish-brown softening. No abdominal periaortic chromaffin body or organ of Zuckerkandl was identified.

The right and left kidneys weighed 75 grams each. A 2.2-cm area of the upper pole of the right kidney was pale and projected slightly above the surface. On cut section the pale area extended down into the medulla and was conical in shape. Other features of the kidneys, ureters, and urinary bladder were normal.

Internal and external genitalia were normal and consistent with the age of the child. The skeletal system and bone marrow were grossly normal.

On microscopic examination the myocardial cells were hypertrophied and the coronary arteries had a thick media. Many pulmonary alveoli contained edema fluid, and some areas of atelectasis were present. Foci of lobular pneumonia containing gram-positive micrococci were accompanied by small amounts of hemorrhage. Some fibrin-filled alveoli were evident.

Hepatic cell cytoplasm was heavily vacuolated throughout the liver. Arteriolar medial hypertrophy was prominent in the portal areas.

Acute fibrinous peritonitis was severe, and in some regions was undergoing organization. The ileum was gangrenous at its point of rupture in the infarcted area. Mucosal and submucosal vessels in this infarcted area were thrombosed; some of them were identified as arteries. In addition, some of the small arteries and arterioles exhibited fibrinoid degeneration of their walls.

Those portions of the left adrenal not involved by tumor had a normal configuration. Cells of the cortex were relatively nonvacuolated.

In the right kidney, the area of infarction extended from the capsule into the medulla and was bordered by early granulation tissue. A thrombus was attached to the wall and partially occluded the lumen of a medium-sized artery in the margin of the infarcted area. Other arteries exhibited medial thickening.

Periaortic lymph nodes were edematous and the sinusoids contained many macrophages exhibiting phagocytosis.

Examination of the blood vessels revealed that the intima of the aorta was thickened by a basophilic myxomatous tissue to an extent

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equal in thickness to one half that of the media. The inner one fifth of the media was infiltrated by similar material. Elastic tissue stains (Verhoeff's) demonstrated fragmentation of elastic lamina and fibrils in this region. Medium and small arteries throughout all sections but lung, had a media thicker than usual. The pulmonary arteries were of normal size. Thrombosis was evident in arteries and veins of the ileum, and an artery of the kidney.

Brain, pituitary, spinal cord, thyroid, thymus, pancreas, pelvic organs and bone marrow were essentially negative.

The thoracic tumor was attached to the periostium of the rib, but did not penetrate it. The left adrenal tumor was surrounded by a thin zone of adrenal cortex, from which it was separated by a thin, irregular connective tissue (fig. 1). Both tumors were composed of cells resem-

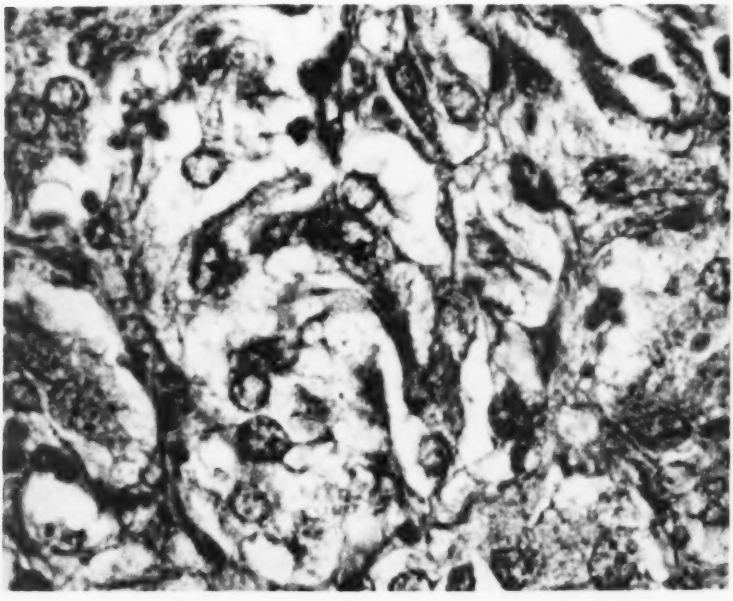

*Figure 1. Pheochromocytoma, showing the grouping of cells in relation to the thin-walled blood vessels. (× 250)*

bling those of the adrenal medulla, being pleomorphic with round to ovoid nuclei which were hyperchromatic or vesicular. Nucleoli were not prominent. The cytoplasm was abundant and eosinophilic with fine granules (fig. 2). Much soluble material was absent from the cytoplasm in the paraffin sections. Both tumors were heavily vascularized and sinusoids were congested with erythrocytes. Large areas of necrosis occupied both tumors, together with small amounts of hemorrhage. Sections stained for the chromaffin reaction (Wissel stain) revealed the presence of fine, yellow-brown granules in the cytoplasm of the

tumor cells. (This reaction was not as strong as in the surgical specimen, due to post-mortem autolysis.)

In summary, this case is one of bilateral adrenal and intrathoracic paravertebral pheochromocytoma. Death is attributed to the complicating cardiovascular disease which resulted in infarction and rupture of the ileum with generalized severe peritonitis. Lobular pneumonia

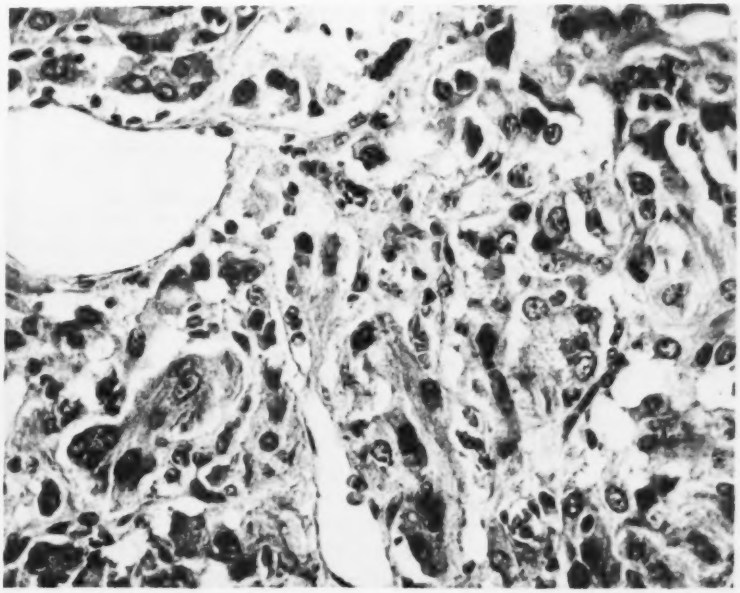

*Figure 2. Pheochromocytoma, showing the detail structure of the tumor cells. (× 400)*

is an additional complication. One cannot resist conjecturing about the clinical dilemma which might have presented itself had the bilateral adrenal tumors been successfully removed and the intrathoracic tumor continued to cause symptoms and elevation of catechol amines.

**Pathologic diagnoses:**

1. Pheochromocytoma, bilateral adrenal and intrathoracic paravertebral sites
2. Hypertensive cardiovascular disease, with thromboses
3. Left ventricular hypertrophy
4. Infarction and rupture of ileum
5. Peritonitis, severe, generalized
6. Infarction, superior pole of right kidney
7. Lobular pneumonia, due to gram-positive micrococci
8. Fatty metamorphosis of liver
9. Emaciation

**Doctor Dimmette:** Pheochromocytomas are commonly known as chromaffin tissue tumors of the suprarenal medulla, and by authorities such as Cecil[1] are not considered as tumors of childhood. The pheochromocytoma was discovered by Eustachius[2] in 1563, and was first described histologically by Kölliker[3] in 1886.

Embryologically the cortex and the medulla develop as distinct and separate organs. The first anlage of the medulla is formed by migration of the sympathetic primitive cells, also known as sympathogonia. The medulla is complete in the 85-mm embryo. The sympathogonia further differentiate into pheochromoblasts and finally into pheochromocytes, which are mature medullary cells. These cells are large, polygonal shaped, with fine granular cytoplasm and round vesicular nuclei. Usually the nucleus is placed in an eccentric position with prominent nucleoli. The reason for a distinct type tumor of the cortex and medulla is on the basis of the histologic and clinical distinct entities. The mature pheochromocytes give rise to the group in which we are particularly interested—namely, the pheochromocytoma which is a chromaffin cell tumor also known as a paraganglioma and has its origin from the mature pheochromocyte cell.

In 1902 Kohn[4] suggested that a chromaffin system consisted of the so-called paraganglionic cells in the carotid gland, the abdominal collections of cells, and the so-called organ of Zuckerkandl (at the bifurcation of the aorta, especially in young children). These cells closely resemble cells of the medulla of the adrenal only in morphology but not in a true chromaffin reaction. The chromaffin reaction is characterized by the deposit of brown granules in the cells when the tissues are fixed in fluids containing potassium bichromate. Under the influence of epinephrine the potassium bichromate is reduced to insoluble peroxides of chromium. Kohn[4] also stressed the fact that paragangliomas have a common origin—embryonic, that is, with the medulla, while Fulk and MacLeod[5] furnished evidence that the active principle of the retroperitoneal chromaffin tissues has the same physiologic action as epinephrine. Maximow[6] pointed out that the chromaffin tissue cells also are found in the kidneys, liver, testes, and heart, with questionable inclusions of the medulla of the suprarenal gland. This theory was discounted when an internal secretion was discovered.

From the descriptive literature the first case can be credited to Perley[7] in 1890. A detailed description of the tumor was made by Manasse[8] in 1893. A rather complete review of the literature was accomplished by Eisenberg and Wallerstein[9] in 1932; 53 cases were reported to that time. In their review, the age range varied from 2½ to 82 years, with the majority (or 30 per cent) of the tumors occurring in the fifth decade and 20 per cent in the fourth decade. In the analysis, they classified or reported five malignant cases. Of these, the age of the patient was unknown in two, and the other three occurred in patients 30, 47, and 68 years of age. Of the 48 cases in

which the sex of the patient was recorded, 25 occurred in women and and 23 in men. Of the five malignant cases, two occurred in men and one in a woman; sex of the other two was unknown.

A renewed interest in the diagnosis of pheochromocytoma occurred in the early fifties with the refinements in technics for the isolation and estimation of epinephrine and noradrenalin compounds in the urine in cases of hypertension. West and Taylor[10] reported a comparison of the output of catechol amines, namely, adrenalin and noradrenalin, in the urine of patients with hypertension and illustrated how the output in patients with pheochromocytoma is far in excess to that range. It is an accepted clinical feature of the disease that paroxysms of hypertension and pheochromocytoma may mimic benign or malignant phases of essential hypertension. The system of pharmacological testing, introduced in 1945, led to the refinement of the test in present use.[10] This consists of injections of histamine, mecholyl, or tetraethylammonium to provoke a hypertensive crisis. The injections of drugs such as benzodioxane or phentolamine, commonly known as Regitine, antagonize the peripheral action of circulating catechol amines. The use of these compounds is not completely reliable and may result in false positive and false negative results.

In 1951, von Euler[11] devised a simple screening test for pheochromocytomas which consisted of the injection of 1 ml of untreated urine into anesthetized cats while recording blood pressure readings. The rise in blood pressure could be equated with standard noradrenalins. Quantities and daily output could be estimated. The objections to this test were the volume of urine per concentration and the reactions of a variable type animal.

In 1954, Manger and his associates[12] used the plasma levels of catechol amines to diagnose pheochromocytomas. At a latter date, West and Taylor[10] stated that they preferred the urinary catechol amines as the surest method available for confirming or refuting the clinical diagnosis. The normal healthy person excretes between 20 and 40 micrograms of catechol amines per day, with a maximum estimated as 60 micrograms. The elevation of urinary catechol amines caused by severe muscular exercise results in only a short period of elevation. Severe hypertensive crisis also results in a short period of elevation, but sustained hypertension usually results with a range of 40 to 60 micrograms, with a maximum of 80 micrograms. Patients who have active pheochromytomas usually excrete an excess of 100 micrograms a day and the results are usually recorded between 225 and 750 micrograms a day. The high rate throughout the day is the best method to estimate daily output rather than a crisis output.

The evaluation of a single case as to benignity or malignancy is practically impossible without evidence of metastasis. Pheomorphism and capsule invasions or multiple local extra adrenal sites have been suggested as criteria for malignancy. Bilateral adrenal or multiple extra adrenal sites where chromaffin system tissue is present is not

believed to be an indication of malignancy due to its frequent finding in adults at autopsy.

Our patient possessed multiple sites of pheochromocytoma rather than a single primary tumor with multiple foci or metastatic tumor.

Doctor Cone, will you further discuss pheochromocytoma in childhood?

**Doctor Cone:** To date, we have located 34 reported cases of typically functioning pheochromocytoma in children less than 14 years of age, including 3 children reported by us.[13] The case presented today is one of these.

The average age of onset of signs and symptoms was at approximately nine and one-half years of age. The sex distribution of this tumor favored the male, occurring in 25 male and in 11 female patients. These tumors are not limited to the white race; they have been observed in six Negro children. The location of these tumors in adult series favors the right adrenal gland, but in children pheochromocytomas are more likely to be bilateral and extra-adrenal in location. In the cases reported in children the sites of occurrence of the tumors were: right adrenal, 14 cases; left adrenal, 8; both adrenals, 9; extra-adrenal, 7. These total more than 36 cases because in some of the reported cases the tumor was multiple.

The organs of Zuckerkandl are much less commonly the site of this tumor than is the adrenal medulla. To date, including one of our cases, there have been four reported instances of a pheochromocytoma of these organs. The organs of Zuckerkandl are found in infants and children in close relation to the aorta, the largest being at the origin of the inferior mesenteric artery. Zuckerkandl[14] found that they normally begin to degenerate early in extrauterine life; degeneration is usually complete by the time the child is six years old. It is of interest that the fetal adrenal medulla and organs of Zuckerkandl contain norepinephrine only; but in the first few years after birth the amount of norepinephrine in these organs decreases and epinephrine begins to appear.

The surgical removal of these tumors is not necessarily difficult, but the preoperative, operative, and postoperative control of the patient's labile and fluctuating blood pressure may be exceedingly difficult, as demonstrated by Hightower, Roth, and Priestly.[15] The operative mortality in the children in whom surgical removal of a pheochromocytoma was attempted was 36 per cent. This figure should not be a deterrent to surgical intervention in all cases of pheochromocytoma, because without operation the prognosis is extremely poor.

Although our three cases were familial in nature, this is not a unique occurrence. We have located five previously recorded instances in which a pheochromocytoma occurred in more than one member of a family.

In a critical review of reported cases of pheochromocytoma, Symington and Goodall,[16] accepted only seven as definitely malignant. Cahill[17] in his excellent review of these tumors stated that only 8 per cent of the approximately 150 cases studied were malignant. Most pathologists agree, however, that the differentiation of a malignant from from a benign pheochromocytoma may be extraordinarily difficult.

Most of the children in whom this tumor was discovered had a persistent hypertension; this is in contradistinction to the adult series where many had a paroxysmal hypertension. Although children seem to have a continuous hypertension, they can and do demonstrate paroxysmal blood pressure rises on the already existing high plateau of hypertension.

The clinical manifestations are due to the high levels of circulating epinephrine and norepinephrine secreted by the chromaffin cells of the tumors. It was previously thought that the hypertension was a result of excessive secretion of only epinephrine; however, Holton,[18] and Goldenberg and co-workers[19] demonstrated that these tumors secrete both epinephrine and norepinephrine. It has been observed that the norepinephrine excretion may be as high as 90 per cent of the total catechol amines present. Our cases confirm this observation.

Norepinephrine differs from epinephrine pharmacologically because it exerts a more marked vasopressor effect than epinephrine, by constricting the blood vessels in the muscles as well as in the skin and viscera. In contrast, epinephrine dilates the muscle arterioles.

The tentative normal values for the circulating catechol amines currently established by the laboratory of Dr. Albert Sjoerdsma[20] of the National Heart Institute, Bethesda, Md., are: norepinephrine 3 to 6 micrograms per liter of plasma, and for epinephrine less than 1 microgram per liter of plasma.

Despite the recent development of more precise pharmacological and chemical tests to assist the physician in arriving at a diagnosis of pheochromocytoma, a blood pressure determination still remains the key to the diagnosis. Unfortunately, in reviewing the literature dealing with this tumor in childhood, one is amazed at how frequently the diagnosis of this tumor was delayed because the child's blood pressure was not taken as part of the physical examination. The determination of a child's blood pressure is not difficult, if the proper sized sphygmomanometer cuff is used. It is advisable to explain each step of the procedure to the child and the local symptoms should be discussed and minimized. If the initial readings are abnormally high, the test should be repeated after a short rest period. If the child has hypertension, a functionally active pheochromocytoma should be included in the differential diagnosis.

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## NEGATION OF THE ESTHETIC

The pros and cons of dark glasses are as diverse as are the people who wear them. Relief from the excessive dazzle of sunlight is only the most obvious motivation. Least comprehensible, perhaps, is the negation of the esthetic. To hide the light of one's eyes beneath a pair of dark glasses can scarcely be aught but traumatic to the charm of one's face. Yet, paradoxically, those who spare no pains and inconvenience in various hairdos and cosmetics show no hesitation in covering up that most attractive of natural features by dark glasses.—Through a Glass, Darkly (editorial). *New England Journal of Medicine,* July 31, 1958.

# Upper Denture—Foreign Body in the Larynx

JAMES H. BRANDENBURG, *Captain, MC, USA*

FOREIGN BODIES can find their way into the air passage of a person of any age. The small child is notorious for placing small objects in his mouth. An adult with a removable upper denture may discover he has aspirated an unsuspected foreign body.[1] A denture itself, however, is a foreign body and can cause serious consequences, as this case report illustrates.

## CASE REPORT

A 30-year-old Mexican presented himself at the emergency room of this hospital in the early morning hours of 22 December 1957. Although the patient could not speak English, the following story was finally obtained through an interpreter. The patient had been drinking most of the night and believed he became unconscious. Upon regaining consciousness, he found he had "swallowed" his partial upper denture. Although there was no marked dyspnea, a laryngeal foreign body was suspected when it was observed that he could not speak above a whisper. Roentgenographic examination confirmed the diagnosis (fig. 1), and the admitting physician referred the patient to me. On indirect laryngoscopy the denture was seen wedged in the glottis with one of the wire clasps hooked over the left vocal cord. This wire clasp appeared to be all that prevented the denture from dropping into the trachea.

The patient was taken immediately to the operating room. Under local anesthesia, with 1 per cent topical Pontocaine hydrochloride (brand of tetracaine hydrochloride), a direct laryngoscopy was performed. With the interpreter carefully explaining every step of the procedure to the patient, the denture was grasped with an alligator forceps. By rotation and a careful rocking motion, the denture was gradually removed (fig. 2). The patient proved to be very co-operative and tolerated the procedure well.

His postoperative course was uneventful, indirect laryngoscopy was normal, and he was discharged from the hospital the following day. Prior to his discharge from the hospital, he was seen in consultation in the dental clinic and was convinced that this poor-fitting partial dental plate was dangerous and should not be used. The patient reluctantly discarded it.

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From William Beaumont Army Hospital, El Paso, Tex. Capt. Brandenburg is now assigned to Brooke Army Hospital, San Antonio, Tex.

## DISCUSSION

In this case the denture was a unilateral, removable, partial plate, fabricated from plastic and designed with a clasp on either

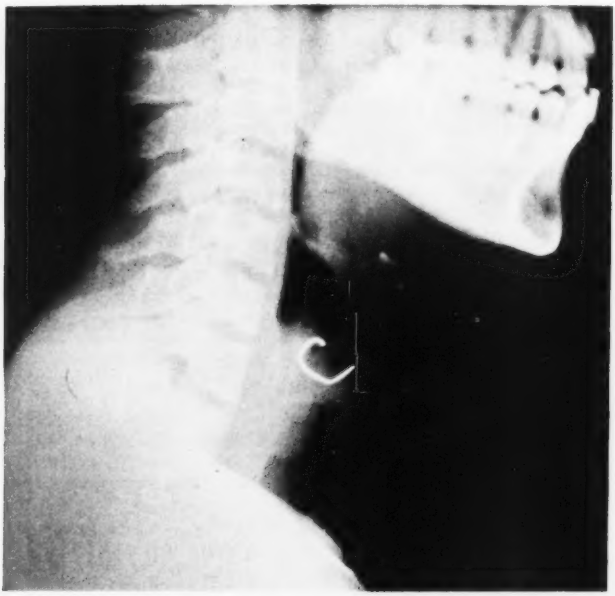

*Figure 1. Roentgenogram showing partial denture wedged in the larynx.*

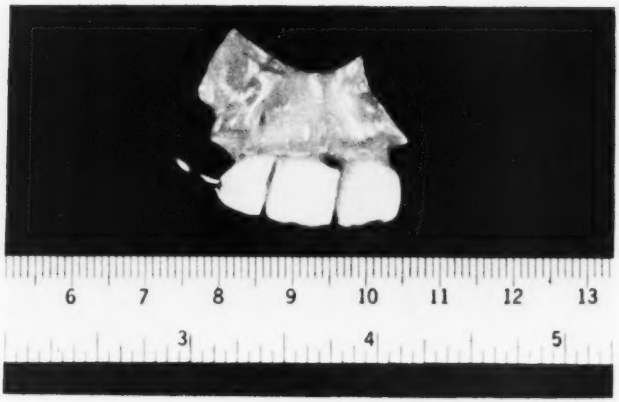


*Figure 2. Patient's upper denture, recovered from the larynx.*

end to hold it in place. One of these clasps had been broken off shortly after the patient had obtained the denture, which was

to be used temporarily until a permanent denture could be made. Because of the expense involved, the patient had decided to use the temporary plate indefinitely.

Loose-fitting dentures are usually a problem for the dentist but also can be a rather serious problem for the otolaryngologist. This danger has been recognized, and this type of removable prosthesis is not recommended even for temporary use.[2]

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## SOCIAL DRINKING IN EAST AFRICA

The average East African consumes a tremendous amount of alcohol at a sitting. He usually will drink all that is available. If he tells you he drinks "all he can get," this could mean 20 to 25 large bottles of "European beer" a day, whereas the average European rarely drinks more than 2 to 3 at a sitting. Moreover, the "European beer" the African drinks is poor local stuff and has toxic effects that good beer does not have. They are fond of spirits of all kinds if they are able to afford them. Some of the native drinks are exceedingly potent. The usual words used in Kenya for native beer made from grains, sugar cane, bananas, maize, or honey, are *pombe* in the interior and *tembo* at the coast. *Tembo* is used less frequently as a specific term for beer made from coconut palm sap, and *mnazi* is more or less synonymous with it. *Mkoma* is beer made from the sap of the branching palm. *Piwa* is any distilled drink, e. g., made from the cashew nut, and it is very strong. "Nubian gin" is a term given to distilled native liquor, is very potent and frequently leads to psychotic behaviour. In recent years in Nairobi, African juveniles have taken to drinking petrol drained from automobiles—needless to say most of them never got to mental hospital, but to the general hospitals or to the morgue!—Edward L. Margetts: The Psychiatric Examination of Native African Patients. *Medical Proceedings. Mediese Bydraes.* October 4, 1958.

# Pilonidal Sinus of the Umbilicus

ROBERT M. HARDAWAY, *Lieutenant Colonel, MC, USA*

PILONIDAL sinuses have been reported in the interdigital webs,[1-6] in the axilla,[7] and in the perineum,[8-9] in addition to the well-known sacrococcygeal site. The present report describes two pilonidal sinuses of the umbilicus.

## CASE REPORTS

**Case 1.** A young enlisted man reported to the surgical outpatient clinic of the 97th General Hospital, Frankfurt, Germany, complaining of a painful, draining umbilicus of several weeks duration. Physical examination showed a hirsute male with a red, swollen umbilicus which exuded pus. In the skin of the umbilicus was a 2-mm hole through which protruded a tuft of many hairs resembling a small paint brush. The hairs were tightly packed in the hole but were readily removed. When the tuft of hair was removed, it was seen that the tuft tapered on both ends and no hair roots were evident. The area surrounding the umbilicus was shaved, the area washed, and the patient instructed to wash the area twice daily with soap and water. On examination one week later in the clinic, the soreness was gone, the inflammation had subsided, and the sinus tract was healed.

**Case 2.** A young enlisted man reported to the surgical outpatient clinic of this hospital, complaining that his umbilicus was painful and had been draining for several weeks. Physical examination showed a rather hirsute body and a swollen, red umbilicus. In the swollen skin was a hole through which protruded a tuft of hair which was easily removed, leaving a 1-mm hole (fig. 1). The surrounding skin was shaved and the hair completely removed. When next seen, the inflammation had subsided and umbilicus had healed.

## DISCUSSION

It has been shown[1-6] that when hair is present in a skin cleft (where two skin surfaces are in contact) it is possible for the hair to erode through the skin and, by its presence under the skin as a foreign body, establish a chronic draining sinus. The fact that hairs usually are present in a sacrococcygeal pilonidal sinus but hair follicles are not,[10-12] would point to a similar mechanism of formation. Epithelium originally does not line the sinus tract, but after the tract persists for some time the epithelium may grow down into it. The congenital anal dimple

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present in many persons is only a dimple. Like any other dimple it is due to the attachment of skin to the underlying bone or fascia by fibrous strands. It may form a superficial pocket (like the umbilicus) which traps hair and debris.

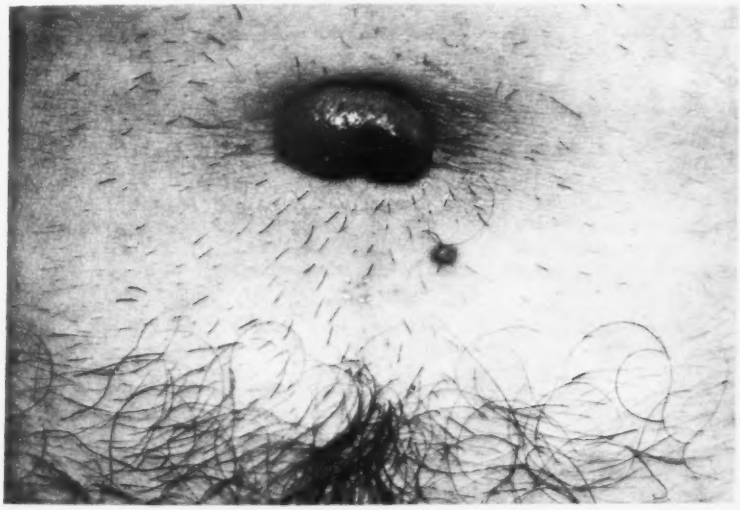

*Figure 1 (case 2). Swollen umbilicus showing a small hole from which a tuft of hair has been removed.*

If this theory of origin of pilonidal sinuses is accepted, the following plan of treatment of all pilonidal sinuses would seem indicated:

Remove all visible hair protruding from the tract and shave the surrounding area to prevent additional hair from entering. Keep the area clean.

If prompt healing does not occur, it must be assumed that additional hair is present deeper in the tract. The tract should be laid open its full length and any foreign bodies should be removed. If epithelium has grown in, it is wiped away. Ordinarily, no tissue is excised. This is a small procedure which can be done under local anesthesia. No sutures are used. Healing is rapid but should be closely supervised in the outpatient clinic.

Abscesses are drained in the usual manner by an adequate incision. Antibiotics are not needed.

This method of treatment has been effective in causing a tremendous reduction in lost time (both outpatient and inpatient) by military personnel.[10,12] Recurrences are less common than with excision because the patient is instructed as to the proper care of the region and the cause of the trouble.

SUMMARY

Two cases of pilonidal sinus of the umbilicus are reported. Pilonidal sinuses may occur wherever skin surfaces are in contact, particularly if there is frequent motion and there is abundant growth of hair. Treatment consists primarily of removal of hair.

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**UNFINISHED BUSINESS IN SCIENCE**

I have no quarrel with the exploration of outer space. It is a legitimate and challenging subject for scientific inquiry and bold experiment. Our optical and mathematical studies of it have long since given us that basic confidence in order without which there could be no science. But, as we extend our astronomy by whatever celestial acrobatics we can get away with, I should like to see some consideration given to relative values. We have a vast amount of unfinished business at our feet. The golden moment for the pickpocket comes when everyone at the county fair is craning his neck at the balloon ascension. So far as the skies are concerned, we are feeling the natural soreness that comes from losing a sporting event we thought was in the bag. Actually, if my information is correct, the Russians had explained that they intended to launch a satellite, had indicated its probable size, and have promised to share the knowledge so gained.—Paul B. Sears: The Inexorable Problem of Space. *Science,* January 3, 1958.

# Rupture of the Spleen in Infectious Mononucleosis

JAMES GARFIELD, *Captain, USAF (MC)*
JAMES H. GENTRY, *Captain, USAF (MC)*

ALTHOUGH infectious mononucleosis is well recognized as a common though protean disease, it is characteristically so benign that only about fifty fatal cases have been reported. Thirty-eight fatal cases are summarized in Liebowitz's[1] monograph. He pointed out that rupture of the spleen is the most common cause of death, accounting for 9 of the 38 cases (24 per cent). One other fatal case is reported by Davis and Hannah.[2] Nonfatal rupture of the spleen in infectious mononucleosis has been reported in 21 cases.[3,5,7,9-12]

Liebowitz stated, "At times rupture has been spontaneous. It has occurred also under physical strain, as in the act of defecation, and possibly by the excessive palpation of the spleen."[1]

Although rupture following abdominal palpation is a commonly taught clinical precept, we were able to find only one case[3] in which this almost certainly occurred. The case which we are presenting illustrates rupture following physical examination.

## CASE REPORT

A 25-year-old man was admitted to this hospital on 25 November 1957, with a history of weakness, malaise, cough, and intermittent fever of one month's duration. He had become ill on return from his duty station in Japan and had been seen by a private physician who treated him for an upper respiratory infection. Past history and contact history were not contributory.

On admission he appeared weak and dehydrated. He evidently had lost considerable weight and appeared both acutely and chronically ill. His temperature was 101.6°F. His pharynx was markedly injected but without exudate. There was moderate posterior cervical and axillary adenopathy. Admission leukocyte count was 10,000 cells per $\mu$l, with 75 per cent lymphocytes, 30 per cent of which were atypical.

We first saw the patient on consultation on his second hospital day. That morning he had noticed that his urine was dark. Physical

From U. S. Air Force Hospital, Lowry Air Force Base, Colo.

examination revealed definite scleral icterus and a slightly enlarged and rather tender liver. Because of a presumptive diagnosis of infectious mononucleosis and the abdominal tenderness, palpation of the abdomen was done cautiously and only by the senior author. The spleen was not felt. Within five to ten minutes after this examination, the patient complained of severe left upper abdominal pain, with radiation to the left shoulder. Re-examination revealed marked tenderness and guarding, especially over the left upper quadrant. A diagnosis of ruptured spleen was made.

The blood pressure fell to shock levels, and the hemoglobin fell from 12.6 to 10.0 grams per 100 ml. Plasma (3 units) and then whole blood transfusions (10 units) were given. As soon as the blood pressure was stabilized, an emergency splenectomy was performed.

At operation a very large, soft, extremely friable spleen was found. There was a large anterior laceration; 4,000-5,000 ml of free blood was found in the abdominal cavity.

Microscopic examination of the spleen revealed some destruction of the follicular pattern. There was mononuclear cell infiltration in the trabecula and sinusoids. Many of these cells were atypical.

Postoperative course was complicated by the development of thrombophlebitis at the site of the venipuncture, but was otherwise uneventful.

Laboratory studies, pending at the time of surgical intervention, revealed a positive cephalin-cholesterol flocculation, a prothrombin time of 100 per cent, and a heterophil-antibody agglutination positive in 1:3584 dilution.

## DISCUSSION

It is well recognized that the soft spleen usually seen in infectious mononucleosis may be difficult to palpate even though markedly enlarged. Although the incidence of palpable spleen in infectious mononucleosis varies from 33 per cent[4] to 72 per cent,[5] the incidence of splenic enlargement is not known. Custer and Smith[6] found that the spleen was invariably enlarged during the height of the disease, as shown by the weights in the protocol of eight autopsies. In three of these cases, death was not associated with splenic enlargement or rupture. Custer and Smith recommended that when infectious mononucleosis is suspected, enlargement of the spleen be taken for granted, palpation be omitted, and the diagnosis established by the more certain means available. The spleen in our patient, as in three others reported in the literature[3,7,8] was so soft as to be nonpalpable. The extremely mild trauma of a cautious physical examination is certainly no more than a patient would be subjected to in normal daily activity. It was our belief that had this patient not been hospitalized, he might well have suffered a so-called spontaneous splenic rupture. Had this calamity occurred far from a medical facility, the outcome might have been quite different.

The question which is raised by this case and other similar cases in the literature is that of hospitalization of patients with infectious mononucleosis. Certainly it is not feasible or practical to hospitalize all patients with the disease, but the potential danger of "spontaneous" splenic rupture does exist. The patient with the "nonpalpable" spleen is not immune to this danger.

## SUMMARY

A case of splenic rupture in infectious mononucleosis following abdominal examination is presented. Thirty-one other cases of splenic rupture in infectious mononucleosis have appeared in the literature. These were reviewed, and only one case was found in which abdominal palpation seemed to be of causal significance. The question of hospitalization in infectious mononucleosis, because of the danger of splenic rupture is raised.

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## NAVY "NUCLEAR NURSING" COURSE

Twelve Navy and two Air Force nurses completed a four-month course in "nuclear nursing" at the U. S. Naval Medical School, Bethesda, Md., on 19 December, conducted under the direction of Captain E. Richard King, MC, USN, head of the Department of Nuclear Medicine. The curriculum included instruction in the principles of radioisotope therapy and procedures for the care of mass casualties as they relate to the diagnosis, treatment, and nursing care of patients.

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## GEN. CATHROE, USAF DENTAL CHIEF, TWO COMMAND SURGEONS, PROMOTED

Major General James S. Cathroe, who was appointed chief of the U. S. Air Force Dental Service in February 1958, recently received his second star and Brigadier Generals James G. Moore and Richard L. Bohannon, USAF (MC), have been promoted from the rank of colonel. Simultaneously with these promotions, Major General Oliver K. Niess, the Surgeon General of the Air Force, was advanced to the permanent rank of major general.

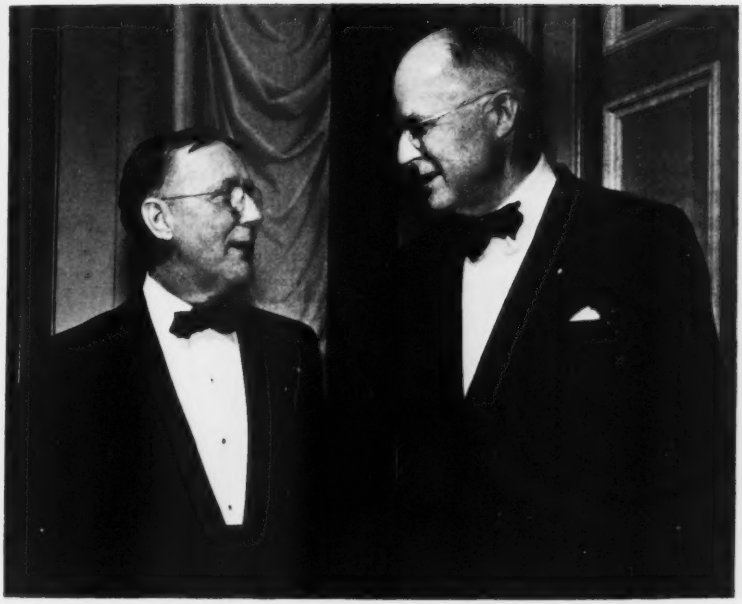
*Gen. Cathroe*

*Gen. Moore*

*Gen. Bohannon*

General Cathroe, a graduate of Creighton University College of Dentistry, entered the service in 1928. He has served as staff dental surgeon of Eastern Flying Training Command, the Caribbean Air Command, and the Air Training Command.

Generals Moore and Bohannon both are native Texans and received their degrees of doctor of medicine in 1932. Both hold the rating of chief flight surgeon and have been certified as specialists in aviation medicine by the American Board of Preventive Medicine. Before being named surgeon on the Air Training Command in August 1957, General Moore was commander of the Air Force's largest hospital at Lackland Air Force Base, Texas. Previously, he served as surgeon of the Western Air Defense Force, Hamilton Air Force Base, California and of the Pacific Division of the Military Air Transport Service in Hawaii. General Bohannon, formerly surgeon of the Fifteenth Air Force, March Air Force Base, California, was named to a similar position in the Fifth Air Force in Japan in the spring of 1958. He has held previous assignments in the Second Air Force and the First Tactical Air Command in Germany.



**HONORED AT SYMPOSIA.** Dr. John B. Youmans, left, technical director of research of the new Army Medical Research and Development Command, was honored last month by symposia on nutrition in internal medicine and on medical education held at Vanderbilt University School of Medicine where he was formerly dean. He is shown with Dr. Frank B. Berry, Assistant Secretary of Defense (Health and Medical), who served as chairman of the symposium on nutrition.

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## PORTRAIT OF GEN. OGLE UNVEILED

A portrait of Major General Dan C. Ogle, USAF (MC), the third Surgeon General of the Air Force, who retired on 30 November 1958, was unveiled recently in ceremonies at the Officers' Club, Bolling Air Force Base in Washington. It is permanently displayed in the Office of the Surgeon General together with those of General Ogle's two predecessors, Major Generals Malcolm C. Grow and Harry G. Armstrong. The painting is the work of Gardner Cox of Boston, one of two living artists with portraits in the National Gallery of Art in Washington. It was accepted as a gift of the Air Force Medical Service by a committee composed of Major General Olin F. McIlnay, Deputy Surgeon General, Brigadier General John K. Cullen, and Colonel George B. Green, USAF (MC).

# AVIATION PATHOLOGY COMMITTEE ELECTS NAVAL CAPTAINS WILBUR AND BALLENGER

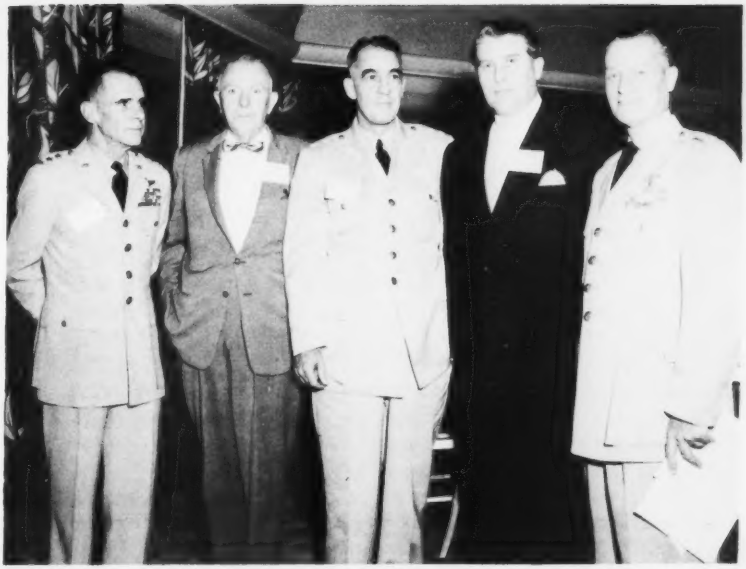
Captains Carl E. Wilbur and Murray W. Ballenger, MC, USN were elected chairman and secretary, respectively, of the Joint Committee on Aviation Pathology at a business meeting of the group held at the Armed Forces Institute of Pathology on 11 December. They succeed Colonel Frank M. Townsend, USAF (MC), Deputy Director of AFIP, chairman for the past two years, and Dr. F. K. Mostofi who has served as secretary since establishment of the committee by Department of Defense directive in 1955.

*Captain Wilbur*

*Captain Ballenger*

Under the chairmanship of Colonel Townsend the committee held its annual scientific session from 29 September to 2 October 1958 at the Royal Air Force Institute of Pathology and Tropical Medicine near London. More than 100 scientists interested in aviation pathology attended this first meeting of the committee outside the United States. Speakers included Air Commodore J. S. Wilson, Director of Hygiene and Research, Royal Air Force, and Air Commodore W. K. Stewart, Director General of the RAF Institute of Aviation Medicine. Panel discussions were led by Air Commodore W. P. Stamm and Group Captain E. Bruce Harvey, RAF, and Drs. W. R. Franks and Howard T. Karsner.

The objectives of the committee are to initiate detailed pathologic examination of aircraft accidents; evaluate any possible human causative role in unexplained accidents; observe recurring traumatic lesions which may be preventable; investigate the possible insidious changes induced by repeated and long exposure to flight conditions; and establish a long-range program of collection of such information and disseminate it to the member services.



**SPACE MEDICINE SYMPOSIUM.** Shown here, from left to right, are some of the leading participants in the Second International Symposium on the Physics and Medicine of the Atmosphere and Space held in San Antonio, Texas, .10, 11, and 12 November under the sponsorship of the U. S. Air Force School of Aviation Medicine: Lieutenant General Walter E. Todd, USAF, commander, Air University; Dr. Hubertus Strughold, advisor for research and professor of space medicine at the school; Major General Oliver K. Niess, Surgeon General of the Air Force, Dr. Wernher Von Braun, technical director, Army Ballistic Missile Agency; and Major General Otis O. Benson, Jr., USAF, commandant of the school. More than 600 space scientists from all parts of the world attended the symposium.

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## ADMIRAL HOGAN RECEIVES PERUVIAN MEDAL

Rear Admiral Bartholomew W. Hogan, Surgeon General of the Navy recently was awarded the *Cruz Peruana el Merito Naval, en el grado de Gran Official Distintivo Blanco* (The Peruvian Cross of Merit) by the President of the Republic of Peru. The decoration was presented to Admiral Hogan by Rear Admiral Luis Edgardo Llosa, Naval Attache at the Embassy of Peru in Washington, D. C., in connection with the celebration of Peruvian Navy Day. The award was given in recognition of the assistance that the Medical Department of the Navy has given to the Peruvian Naval Medical Service.

# FIVE RESERVE NAVAL MEDICAL OFFICERS PROMOTED TO RANK OF REAR ADMIRAL

Five distinguished physicians, who served in the Navy during World War II, recently were promoted to the rank of rear admiral in the Medical Corps, U. S. Naval Reserve. The new flag officers are: Joseph S. Barr, Newton Center, Mass; Francis J. Braceland, Hartford, Conn.; William L. Rogers, San Francisco, Calif.; Robert A. Ross, Chapel Hill, N. C.; and Wendell G. Scott, St. Louis, Mo.

Dr. Barr, clinical professor of orthopedic surgery at Harvard Medical School, served on active duty from December 1941 until March 1946. During the first two years of the war he organized and developed audio-visual educational aids that were of great value during the rapid wartime expansion.

A specialist in neuropsychiatry, Dr. Braceland was on active duty from January 1942 to June 1946. Under his guidance the neuropsychiatry program of the Bureau of Medicine and Surgery was expanded into a leading component of the Medical Department. He is psychiatrist in chief of the Institute of Living and clinical professor of psychiatry, Yale University School of Medicine.

Dr. Rogers, who is clinical professor of surgery at Stanford University School of Medicine, served for three years during World War II in various advance base hospitals in the Pacific theater and later was chief of the surgical service at the U. S. Naval Hospital, Corona, Calif.

An obstetrician, who won the Purple Heart, Dr. Ross saw action in early 1944 in the Philippines and at Okinawa. Subsequently he was chief of obstetrics at the U. S. Naval Hospital, Charleston, S. C. He is professor of obstetrics and gynecology at the University of North Carolina School of Medicine.

Dr. Scott, the wartime chief of radiology at the U. S. Naval Hospitals in San Diego, Calif., and Seattle, Wash., received a commendation from the Chief, Bureau of Medicine and Surgery for his outstanding service in diagnostic and therapeutic radiology. He is now professor of radiology at Washington University School of Medicine.

*Adm. Braceland*

*Adm. Ross*

*Adm. Rogers*

*Adm. Scott*

**MILITARY NEUROSURGEONS.** Here are the officers of the Society of Military Neurosurgeons which will hold its fourth annual meeting at the U. S. Naval Base, New Orleans, on 30 April 1959, in conjunction with that of the Harvey Cushing Society. From left to right: Colonel Wistar L. Graham, USAF (MC), U. S. Air Force Hospital, Maxwell Air Force Base, president; Lieutenant Colonel George J. Hayes, MC, USA, vice president; and Captain Frank B. Clare, MC, USN, U. S. Naval Hospital, Portsmouth, Virginia, secretary.

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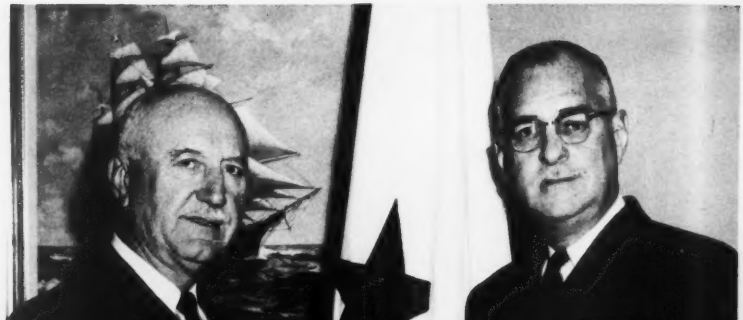
**RESERVE COUNCIL MEETS.** Shown above is the Advisory Council to the Army Surgeon General on reserve affairs which met recently in Washington to discuss the activities of the Army Medical Service reserve program. Seated left to right are: Major General Silas B. Hays, The Surgeon General, Brigadier General Perrin H. Long, and Major General James P. Cooney, The Deputy Surgeon General. Standing are: Colonel James H. Kidder, Special Assistant to the Surgeon General for Reserve Forces; and Brigadier Generals Alexander Marble, Harold G. Scheie, Frank E. Wilson, Manfred U. Prescott, Harold C. Lueth, Truman G. Blocker, Jr., Carl S. Junkermann, Thomas P. Fox, Joseph M. Bosworth, and James B. Mason.



**NEW FLAG OFFICER.** Rear Admiral Thomas F. Cooper, MC, USN, left, Commanding Officer of the National Naval Medical Center, Bethesda, Md., presents Rear Admiral Calvin B. Galloway, MC, USN, with his appointment to his present rank in ceremonies held on 1 December. The new flag officer has been assigned to the Bureau of Medicine and Surgery as Assistant Chief for Research and Military Medical Specialties. Prior to his promotion he had been Commanding Officer of the U. S. Naval Medical School and is a former head of the U. S. Naval Medical Research Unit in Cairo, Egypt.

## AIR FORCE CLINICAL SURGEONS MEETING

"Surgical Complications" is the theme of the forthcoming annual meeting of the Society of Air Force Clinical Surgeons at Wright-Patterson Air Force Base, Ohio, 11-13 May 1959, according to announcement by Colonel Don S. Wenger, USAF (MC), president of the group. Air Force Medical Corps officers who are interested in joining the society should write to the secretary, Major Nicholas M. Azzato, USAF (MC), Lackland Air Force Base, Texas.

# A MESSAGE FROM THE A. M. A.

The Bureau of Health Education of the American Medical Association, which is concerned, among other things, with the health and safety of school children, has prepared the following suggestions regarding disaster protection at school.

The school is one of the largest assemblages of people in the community. It includes members of a significant proportion of the families comprising the community. Inasmuch as children are in school a good part of each day there is a fair probability that any disaster, be it enemy action or fire, flood, storm, or explosion, may occur during school hours. The need for coordination of the school disaster plan with the civilian defense program is obvious.

Learning is easier and what is learned is remembered longer when it can be interpreted in terms of the learner's experience. Much of the failure of John Q. Citizen and his children to learn the routine procedures for civilian defense can be attributed in part to the idea that "it can't happen here," because enemy action is foreign to their home experience. On the other hand, there is ample evidence of the success with which communities and their schools have prevented many casualties from storm, fire, and explosion, and have efficiently cared for the injured. From the solution of problems caused by these "natural" disasters to the handling of casualties and the evacuation of large groups exposed to the disaster of warfare is a step that is within the understanding of most people. It would seem, then, that every effort should be made to help schools make plans for the protection of pupils from the more common mass hazards in such a way that these plans would be equally applicable to disasters of less common occurrence.

This subject was discussed by a group of physicians, educators, and public health personnel at the American Medical Association's Fifth National Conference on Physicians and Schools. It was the concensus of this group that civilian disaster planning for school populations must be fluid and in accord with local civilian defense and disaster planning for the total population. In disasters which strike suddenly, the alternatives are to "duck and cover" or to concentrate students at the core of the building. Where warning provides a reasonable time for preparation there may be either a planned evacuation conducted by school officials with mass transportation to a predesignated reception center, or release of pupils to homes for evacuation of families. A combination of these is possible, depending on such factors as the occupation and location of parents, age of children, availability of transportation, and other local factors.

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From the Council on National Defense of the American Medical Association. The views and opinions expressed are not necessarily those of the Department of Defense. —*Editor*

Family integrity should be preserved wherever possible but, inasmuch as this may not be possible, a plan utilizing school facilities and personnel should be available. This must involve suitable delegation of authority and responsibility to each adult in the school so that in a crisis everything works as smoothly as a modern fire drill.

Obviously, it is not possible in a few words to suggest how every type of school should plan for every type of disaster. However, with local conditions in mind, most schools should consider at least these significant items:

1. *Communications.* How to communicate and with whom must be preplanned. Persons responsible for communication and their alternates must be designated and authorized in advance. Communication must be established with agencies responsible for group safety as well as with parents to allay parental anxiety.

2. *Evacuation.* Tornadoes, hurricanes, earthquakes, floods, fires, and explosions—as well as the threat of enemy action—may require evacuation of the school building. Drills should be carried out to establish routes and the duties of rescue teams, monitors, safety patrols, teachers, engineers, bus drivers, and others.

3. *Immunization.* Basic immunization should be maintained, especially against tetanus. Children should know the conditions against which they have been protected, drugs to which they are allergic, and chemicals to which they are sensitive.

4. *Identification.* Children should be identified as recommended by the local civilian defense authority, which may be related to existing school health record systems.

5. *First aid.* Supplies for first aid should be maintained at the maximum potential level and provision made to transport them during evacuation. Teaching and supervisory personnel, engineers, and bus drivers should be trained in the practical use of first-aid supplies and psychologic support.

6. *Other supplies.* In isolating disasters, such as a flood or blizzard, food and bedding will be needed at school. School lunch supplies maintained at maximum will be adequate in most instances. Cots, blankets, and other disaster supplies belonging to civilian defense organizations or the Red Cross can be stored in the school and thereby be readily available to both the school and the community.

7. *Termination of schools' disaster jurisdiction.* Children should be returned to their own family unit at the earliest possible moment, or, if the family is a casualty, to the official agency responsible.

The welfare of our children demands constant vigilance against disaster. A planned program of action to meet all eventualities is the better part of such vigilance. Community plans must include the schools—and school plans must recognize community relations. In planning to meet disaster, all groups and individuals who may be involved should be consulted and, where practical, included in the formulation, development, and implementation of the plan.

# CORRESPONDENCE

## SURGICAL TREATMENT IN NECROBIOSIS LIPOIDICA DIABETICORUM

*To the Editor:* I read the interesting report of a case of necrobiosis lipoidica diabeticorum by Captain Virgil H. Voss, USAF (MC), on pages 1654-1658 of the *U. S. Armed Forces Medical Journal* for November 1958. For the sake of completeness I wish to call attention to two important references overlooked by the author, which emphasize the possibility of treatment of this condition by surgery. The first is a paper by E. P. Cawley, and R. O. Dingman, in *A. M. A. Archives of Dermatology and Syphilology* 63: 764-767, June 1951. The second, of more recent vintage is by J. W. Kelley, in *Plastic & Reconstructive Surgery* 22: 342-347, October 1958. In the cases reported in these two papers, treatment consisted of radical excision and skin grafting.

ROBERT H. IVY, M. D., Editor
*Plastic & Reconstructive Surgery*
Paoli, Pa.

## HEMORRHAGE OR INFARCT?

*To the Editor:*—I read the article on pages 1364-1369, in the September 1958 issue of the *Journal,* by Colonel Arthur J. Levens and Captain Frank W. Kiel, entitled "Wallenberg's Syndrome Resulting from Hemorrhage," with great interest. This condition is indeed one with which all clinicians should make themselves familiar since all too often the average physician is perplexed when confronted by this syndrome and assumes that the patient must have a brain tumor. I would like to take exception, however, to the main thesis of the paper, that the patient suffered his illness due to a hemorrhage. Actually the cerebrospinal fluid examination performed on the day of onset revealed no cells, and none were found until the fifth day after the onset, when only 2,600 red cells per cubic milliliter were found along with xanthochromic fluid. The photographs in the article would indicate to me that the patient had actually suffered a hemorrhagic infarct in the medulla rather than an actual hemorrhage, such as was implied by the title.

EDWARD J. SULLIVAN, M. D.,
Jacksonville, Florida

*Dr. Sullivan's letter was referred to Colonel Levens and Captain Kiel, who made the following comment:*

From a clinical standpoint, the authors favor the diagnosis of hemorrhage rather than infarct because of the following: 1) The relative youthfulness of the patient would appear to be against thrombotic episodes. 2) A history of hypertension was present and this is often associated with hemorrhage.[1] 3) Blood does not necessarily appear in the subarachnoid space in hemorrhage[2] nor in infarction,[3] and an admixture of blood in the cerebrospinal fluid may be found in either

hemorrhage or infarction.[2] 4) There was no evidence to support an embolic process.

From the pathologic viewpoint, the authors favor the diagnosis of hemorrhage because of the following: 1) Thrombosis was not evident in the posteroinferior cerebellar arteries. 2) No apparent areas of thrombotic damage. 3) There was a sharp demarcation between hemorrhage in the medulla and the adjacent uninvolved tissues. 4) There was, again, no pathologic basis for emboli. In regard to the tardy appearance of blood in the cerebral spinal fluid, the authors believe, in view of the above, that this is merely an interesting feature of the case and in itself argues neither for nor against hemorrhage or infarction. Evidence, clinical or pathologic, for arteriosclerosis, either cerebral or elsewhere, was minimal or absent. Others' experiences would be appreciated.

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## BOUQUET FOR NOVEMBER JOURNAL

*To the Editor:* I just read the lead article in the November 1958 *U. S. Armed Forces Medical Journal* on the management of acute appendicitis by Colonel Bowers and associates, and Dr. Cunningham's article on The Confederate Medical Service. I believe this is one of the best issues of the *Journal* yet published. The appendicitis article should be read by all junior medical officers and senior aid men. It was pathetic to find the problems of the Confederate medical officer still with us in so many instances.

THOMAS H. LANE, Lt. Col., MC, USA
Surgeon, XVIII Airborne Corps
Fort Bragg, N. C.

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## REHABILITATION CONGRESS IN MEXICO CITY

Dr. Frank B. Berry, Assistant Secretary of Defense (Health and Medical), Rear Admiral Bartholomew W. Hogan, Surgeon General of the Navy, and Captain Reginald Rambo, MC, USN, of the Bureau of Medicine and Surgery, attended the Second National Congress on Rehabilitation of the Disabled in Mexico City in November. Organized by the Mexican Rehabilitation Association, and sponsored by the 13th National Assembly of Surgeons in Mexico, the Congress serves to promote rehabilitation for the Republic of Mexico, and to make studies of various programs of rehabilitation.

# OFFICERS CERTIFIED BY SPECIALTY BOARDS

The Surgeons General of the military departments have announced that the following regular Medical Corps officers have been certified by the specialty boards indicated.

### American Board of Dermatology

Johnson, Waine C., Capt., USA
McFadden, Archibald W., Capt., USA
Norman, Clyde W., Capt., USN
Vineyard, William R., Maj., USA

### American Board of Pathology

*Clinical Pathology*

Irey, Nelson S., Lt. Col., USA

### American Board of Ophthalmology

Skeehan, Raymond A., Jr., Lt. Col., USA
Stevenson, Roger, Cdr., USN

### American Board of Otolaryngology

Hanna, Homer H., Capt., USA

### American Board of Surgery

*Board of Thoracic Surgery*

Winn, Dean F., Maj., USA

### American Board of Anesthesiology

Cox, Dana D., Capt., USA

### American Board of Prosthodontics

Lundquist, Donald O., Capt., USA

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# DEATHS

BLOCHBERGER, Irene Caroline, Lieutenant Colonel, ANC, USA, of Leavenworth, Kans.; stationed at Fitzsimons Army Hospital, Denver, Colo.; graduated in 1932 from St. John's Hospital School of Nursing, Leavenworth; commissioned a second lieutenant in the United States Army 28 August 1937; died 7 November 1958, aged 47, at Fitzsimons Army Hospital of multiple myeloma.

GOULD, Robert Barry, First Lieutenant, ANC, USAR, of Vancouver, Wash.; stationed at 28th General Hospital, France; graduated in 1954 from St. Joseph's Hospital School of Nursing, Tacoma, Wash.; served in an enlisted status from 15 November 1955 to 25 April 1956; commissioned a second lieutenant in the United States Army Reserve 13 March 1956; ordered to active duty 27 April 1956; died 14 November 1958, aged 26, in France from injuries received in an automobile accident.

SHALLMAN, Morton, Lieutenant Colonel, DC, USAR, of Chicago, Ill.; stationed at U. S. Army Hospital, Fort Hood, Tex.; graduated in 1940 from Loyola University School of Dentistry, Chicago, Ill.; served in an enlisted status from 26 December 1936 until 15 May 1938; commissioned a first lieutenant in the United States Army Reserve 7 September 1940; ordered to active duty 2 January 1941; died 29 October 1958; aged 44, at U. S. Army Hospital, Fort Hood, of coronary occlusion.

# Reviews of Recent Books

MEDICINE AND THE NAVY, 1200-1900, by *J. J. Keevil,* D. S. O., R. N. Volume II, 1649-1714, 332 pages; illustrated. E. & S. Livingstone, Ltd., Edinburgh and London, Publishers, 1958. Distributed by The Williams & Wilkins Company, Baltimore, Md., 1958. Price $8.50.

In this second volume of his history of the Medical Department of the Royal Navy, the author covers one of the most important periods in British naval annals, the times of Cromwell and the later Stuart sovereigns. Both were partial to the navy, and initiated many administrative changes and reforms in the care of the sick and wounded, and the status of naval surgeons. Interest in the sea service is shown by the noble preamble to the Naval Regulations issued by Charles II, where it states "It is upon the Navy under the good Providence of God that the safety, honour, and welfare of this Realm do chiefly depend." James II served at sea in the Dutch wars of the 17th century, and his daughter, Mary, was responsible for turning a former palace into the first naval hospital of modern times, the naval hospital at Greenwich, for the use of the Royal Navy.

One fundamental administrative change made during the period from 1649 to 1714, was the establishment of the office of surgeon general or "Chirurgeon Generall" as it was then written. James Pearse assumed the office on 30 March 1675. For the first time the navy had some central direction of medical care by a medical man. Other improvements were standard lists of medical stores for ships of different rates; higher standards of professional training for naval surgeons; better equipment of hospital ships; and higher pay and more recognition of medical personnel. The author gives many thumbnail sketches of men who were leaders in naval medicine at that time. One was William Cockburn, whose book, *"The Account of the Distempers of Seafaring People,"* was long a standard work. James Yonge, Hugh Ryder, and John Moyle were others who showed that in all ages there are outstanding medical men, the equal of those today in skill, resource, and devotion to patients.

Dr. Keevil had planned a monumental naval medical history of the British navy, to fill perhaps four or more volumes. His untimely death in 1957 is all the more to be regretted because he was so well fitted for the task, not only as a medical historian with a real literary gift, but, as a former medical officer of the Royal Navy, with experience in peace and war, he had an intimate knowledge of the work and problems of the naval surgeon. He had received the D. S. O. for devotion to duty in the air attack on the *Illustrious* in 1941. Like the first volume, this one is handsomely bound in blue and gold, and with fine paper and typography There is an extensive bibliography, and a most useful chronology of naval and naval medical history during the period covered by the narrative. —*LOUIS H. RODDIS, Capt., MC, USN, (Ret.)*

RADIATION PROTECTION, by *Carl B. Braestrup* and *Harold O. Wyckoff.* Contributors: *Merrill Eisenbud, Titus C. Evans,* and *S. Allan Lough.* 361 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $10.50.

This book is written to present currently available knowledge and technical data on radiation protection to a large number of people who are working with radiation sources, but are not themselves experts in radiation protection. The authors have accumulated a large body of useful data, much of which has been determined experimentally, and a minimum amount of theory. Much of the data here presented is available in other places, notably the *Radiation Protection Handbook,* published by the National Bureau of Standards, but the organization of material presented in this volume and the simple, explanatory way in which the text is written make it much more valuable than the sources from which it draws. The authors draw from their own experiences wherever possible to illustrate points or make "common sense" recommendations. This is evident in the sections on measurement of radiation and hazard control. The presentation of biological effects of radiation, nonsealed radioactive sources, and atmospheric contamination blend well with the rest of the book. The appendix contains distance protection data, particle ranges, and attenuation data for x and gamma ray beams in various materials. The book is well worth the price to one interested in gaining a single useful source of radiation protection data, although the more advanced worker will probably find nothing here that is not already available in other publications.—*THOMAS G. MITCHELL, Lt., MSC, USN*

AN ATLAS OF ESOPHAGEAL MOTILITY, in Health and Disease, by *Charles F. Code,* M. D., Ph. D.; *Brian Creamer,* M. D., M. R. C. P.; *Jerry F. Schlegel,* B. S.; *Arthur M. Olsen,* M. D., M. S. in Medicine; *F. Edmund Donoghue,* M. D., M. S. in Medicine; and *Howard A. Andersen,* M. D., M. S. in Medicine. 134 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $8.50.

This small attractive atlas summarizes a good deal of information about the gullet's muscular activity. If the reader does not expect it to be more than the atlas it intends to be, he will find here a clear and pleasing presentation of esophageal-pressure patterns in health, and in achalasia, and scleroderma. It is a summary of seven years of experience in recording such pressures. The material is dealt with in a completely noncritical fashion, and the pressure tracings presented are single, typical examples of each phase of the various subjects encompassed. There is very brief but notably lucid explanation of the patterns shown: ". . . we became convinced that the (tracings) tell the story themselves. . . ." The pressure graphs and halftones have been prepared with emphasis on clarity and simplicity, in the spirit of a walk-through display and, as published, they appear large, pleasant, and luxurious. The authors obtained the recordings through use of a miniature, swallowed, electromagnetic pressure transducer. Intraluminal esophageal pressure changes move a tiny iron plunger within the coils of a differential transformer, all within a 3 by 9 mm capsule at the end of an esophageal tube. For simultaneous recordings from different esophageal levels, multiple open-tip tubes connected to

extracorporeal transducers were used. The electrical output is carried to a large, complicated-looking amplifier, galvanometer, and recording camera. Respiratory activity and the electrical potentials of the voluntary phases of swallowing are recorded synchronously. The thoracic surgeon and gastroenterologist should know the things that this book has to teach. They will not be able to find elsewhere the information so completely and clearly summarized.

—*EDDY D. PALMER, Lt. Col., MC, USA*

CIBA FOUNDATION COLLOQUIA ON ENDOCRINOLOGY. Volume XII: Hormone Production in Endocrine Tumours. Editors for the Ciba Foundation: *G. E. W. Wolstenholme*, O. B. E., M. A., M. B., B. Ch., and *Maeve O'Connor*, B. A. 287 pages; with 58 illustrations and cumulative index to Volumes I-XII. Little, Brown & Company, Boston, Mass., 1958. Price $9.

This twelfth volume of the Ciba Foundation Colloquia on Endocrinology presents the papers and discussions of a limited-attendance meeting held in London from June 24 to 26, 1957. Each paper served to summarize the work of the author in a particular area and as a starting point for the subsequent discussion. Most of the presentations were concerned with the production, biochemistry, physiology, and maintenance of hormone-producing tumors in experimental animals. Those related to human cancer and of value to physicians were the subjects of iodinated compounds in the serum of patients with thyroid cancer, the excretion of gonadotrophins in patients with hydatidiform mole or chorionepithelioma, and the effects of hypophysectomy.

This book is of considerable value to investigators in this field since it brings together in one volume a summary of much current information. Particularly helpful is the inclusion of the discussion. While there is some information of clinical significance regarding the applicability of various hormone assays in the differential diagnosis of hormone-producing tumors, this volume is of limited value to the practicing physician. A cumulative index including the present and the eleven preceding volumes is included.

—*NATHANIEL I. BERLIN, Lt. Cdr., MC, USNR*

DISEASES OF THE LIVER AND BILIARY SYSTEM, by *Sheila Sherlock*, M. D., F. R. C. P., M. R. C. P. 2d edition. 719 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $11.50.

A medical textbook must achieve popularity to warrant a second edition only three years after the first publication. Dr. Sherlock's treatise was published in March 1955, reprinted in October 1956, and published in Spanish in 1956. The second edition, issued in May 1958, is required to report additions to our knowledge and to "recast" previous material to accord with these fresh views. The author has retained the original format: a description of the functional and morphological changes which may occur in the liver, and the clinical and laboratory methods used to study them. Afterward, individual disease entities are described. Clinical diagnosis and treatment are given a prominent place throughout the book. The new book contains four

pages less than the first edition; many references have been deleted and replaced by 500 new ones, mostly recent ones. The newer knowledge of bile pigment metabolism, of drug-induced jaundice, of the chemical changes which accompany hepatic coma are suitably integrated into the appropriate places in the text and illustrations. The entire volume appears to have been thoroughly rewritten and considerably improved. Dr. Sherlock's own extensive experience is reflected throughout the book and it gives a quality of confident assurance to the writing. This book will be useful to all physicians who must treat patients with liver disease.

—*BENJAMIN H. SULLIVAN, Jr., Col., MC, USA*

SOCIAL PSYCHIATRY IN ACTION, A Therapeutic Community, by *Harry A. Wilmer,* M. D., Ph. D., Captain, MC, USNR. Foreword by *Francis J. Braceland,* M. D. Preface by Rear Admiral *Bartholomew W. Hogan,* MC, USN. 373 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $8.75.

This book is a report of an experiment in milieu and social psychiatric therapy in the closed ward of the U. S. Naval Hospital, Oakland, California, the West Coast psychiatric treatment center. The study is well documented and gives the reader the authentic atmosphere and "the feel" of a closed ward in a graphic use of the patients' own language. That "the care of the patient is a matter of caring for the patient" is subtly, but clearly, pointed out. The influence of the environment, i. e., the attitudes of the entire therapeutic team and the value of planned and analyzed group therapy sessions, is graphically explained as a new method of ward management and therapy. The author is careful not to project his conclusions on to other situations, contenting himself with fully describing what happened in the daily "community" meetings on the ward, and the staff conferences of the ward personnel which followed immediately. Aside from the psychiatrist, none of the ward personnel was specially trained for this approach but, under the impetus of Dr. Wilmer's enthusiasm and dedication, they became motivated. There was further help from his artful use of psychoanalytic insight into personality structure and his acute powers of observation. All aspects and problems of the program used on the ward during this period, including what was done or not done about medications, seclusion rooms and suicidal threats, are reported as they happened. The only embellishments are the author's clear prose descriptions.

The volume contains two extensive bibliographies, listed as primary and secondary, with subgroups under the primary (key articles), giving reference to the major literature on both milieu and group psychotherapy. There are many charts indicating the varied diagnoses, backgrounds and ages of the many patients. There is a foreword by Dr. F. J. Braceland and a preface by Rear Admiral B. W. Hogan, Surgeon General of the Navy. The book has much to offer anyone working in this field, and should be in the library of every military medical establishment that has a closed ward. —*FELIX H. OCKO, Capt., MC, USN*

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THE PRACTICE OF NUCLEAR MEDICINE, by *William H. Blahd,* M. D., *Franz K. Bauer,* M. D., and *Benedict Cassen,* Ph. D., introduction by *Paul Aebersold,* Ph. D., foreword by *Joseph F. Ross,* M. D. 407 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $12.50.

This is the latest book covering the expanding field of nuclear medicine. The authors have had personal experience in the field, and the straightforward method of presentation is a reflection of their background. The volume is divided into four parts devoted to physical principles, diagnostic methods, therapeutic applications, and laboratory and instruments. The clinical discussions are particularly lucid, and emphasize the pitfalls as well as the benefits of the use of isotopes in medicine. The sections on hematologic problems are good. The physical principles are covered simply but perhaps too briefly for the uninitiated. Also, many of the pictures of laboratory equipment are now outdated. Simpler and more versatile equipment is available. This volume is well worth the perusal of anyone wishing an appreciation of the potentials of radioisotopes.

—*JAMES B. HARTGERING, Lt. Col., MC, USA*

CONGENITAL ANOMALIES OF THE HAND AND THEIR SURGICAL TREATMENT, by *Arthur Joseph Barsky,* M. D., D. D. S. American Lecture Series, Publication Number 311, A Monograph in The Bannerstone Division of American Lectures in Orthopaedic Surgery, edited by *Charles Weer Goff,* M. D. 165 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $5.75.

This monograph is an interesting contribution to the growing literature on hand surgery. It is unique in its limitation to the discussion of congenital anomalies of the hand, a heretofore somewhat neglected area. The material presented is concise and easily readable with short sections on etiology and embryology. Most of the text is devoted to descriptions of individual anomalies with considerable stress on incidence and statistical analysis. The space devoted to treatment is short with well-illustrated examples of some of the available technics. The book is beautifully illustrated and contains a fine bibliography of over 200 pertinent articles. This volume is of particular interest to the pediatrician and general practitioner as a handbook of present-day concepts of congenital anomalies of the hand, and is recommended to those engaged in hand surgery. The material presented is taken primarily from the author's own experience but is well supplemented from other sources. —*NICHOLAS M. AZZATO, Maj., USAF (MC)*

EPILEPSY HANDBOOK, by *Frederic A. Gibbs,* M. D., and *Frederick W. Stamps,* M. D. 101 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $4.75.

Epilepsy is so frequently mishandled medically, psychologically, and socially that a great need for this compact little volume exists. It is neatly bound, clearly printed and adequately illustrated. The language is simple and uncluttered by pedantic gibberish. It is written for all physicians, can be read in one evening, and offers essential information in a condensed form.

A color photograph of all the commercial forms of antiepileptic drugs introduces the book. In short, well-illustrated chapters epilepsy is adequately discussed. The disorder is defined, its causes elaborated, subtypes described, and modes of therapy outlined and rationalized. Relationships of heredity and epilepsy receive logical, common-sense treatment. In few words the authors point out how the electroencephalogram can best be used. Principal electrographic differences between cerebral dysrhythmic types are clarified but not exaggerated.

The section on medication is of great value. Each useful antiepileptic drug is briefly but carefully discussed, and its indications and possible side effects are mentioned. A table of differential diagnosis and management is a useful addition, and a fairly extensive bibliography is included. This book should be read by any physician who ever treats an epileptic patient. While it is somewhat oversimplified, a rational idea of epilepsy is presented in highly readable form. It is warmly recommended as a valuable addition to any medical library.

*—HENRY W. HOGAN, Maj., MC, USA*

PRINCIPLES OF RADIOGRAPHIC EXPOSURE AND PROCESSING, by *Arthur W. Fuchs.* 2d edition. 284 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $10.50.

The material in this book was developed to train U. S. Army x-ray technicians at an accelerated rate during World War II. The original version of this text is currently contained in two Army training manuals, "X-ray Film Processing" and "Principles of Radiographic Exposure." The author attempts to give a complete course in x-ray technic in 26 short chapters, and he succeeds quite admirably. The first few chapters are devoted to the theory and history of x-rays, radiographic terms, and x-ray film. The author discusses image characteristics, radiographic exposure, and body tissues, and the important functions of focus-film distance, kilovoltage, and milliampere-seconds. In this portion of the book he discusses theory, experiment, and application in relation to each of the above factors. The remainder of the first part of the book is devoted to standardization of exposure and the development of exposure tables. The second part of the book is devoted to x-ray film processing and stresses that correct processing is an important function in radiography, because uniformity in result is dependent not only upon the exposure technic employed, but also upon the care with which the film is processed. The material is simplified and readable and should assist any radiologist or technician in the production of better radiographs.

*—JOHN L. HATCH, Capt., MC, USN*

THE WAKING BRAIN, by *H. W. Magoun,* Ph. D. 137 pages, illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $4.75.

This volume presents the role of the reticular system in wakefulness and behavior and includes discussions of the reticulospinal influences and postural regulation, reticular influences upon central afferent transmission, reticulohypothalmic influences and neuroendocrine

regulation, reticulodiencephalic and rhinencephalic systems and emotion, reticulocortical influences for wakefulness and attention, nonspecific brain mechanisms and neuropharmacology, and reticular influences and cortical activity. The author has utilized the publications of others extensively in compiling this informative book, but he himself has contributed generously to the investigations in this field. He lists 197 references and his name is included in 20 of these. To present the information succinctly, the language of the neurophysiologists is used. For anyone with an interest, however remote, in the anatomy and physiology of the central nervous system, it is well worth the time and labor to whatever degree needed to become acquainted or reacquainted with the scientific armamentarium and terminology of the neurophysiologists and to explore the concepts reported here. The greatest usefulness of this book for the neurophysiologist is the collection of data in this one volume and the extensive bibliography. Most of the material has been published in scientific journals and in the bound volumes of the transactions of the conferences on nerve impulse sponsored by the Josiah Macy, Jr. Foundation. The printing and binding are superb and the text is amplified liberally with clear and well coded figures.

*—WILMOT F. PIERCE, Capt., MC, USN*

BLOOD GROUPS IN MAN, by *R. R. Race*, Ph. D., M. R. C. S., F. R. S., and *Ruth Sanger*, Ph. D., B. Sc., with a foreword by Professor Sir *Ronald Fisher*, F. R. S. 3d edition. 377 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $8.50.

The third edition of this standard reference work is a welcome addition to any library at a time when so many new facts are being discovered. Since the last edition in 1954, our knowledge of the Rh factor and the so-called minor systems has increased tremendously. The authors have handled the material in a masterly fashion, placing emphasis in the proper places and pointing out the areas of practical application as opposed to those of strictly academic interest. This is one of those rare volumes with a clarity of style that will be appreciated by both the general physician and researcher. Although the title of the book implies a discussion of all methods of blood grouping, the book is limited to the traditional concepts dealing almost entirely with the antigens of the red cells. Discussions of the various hemoglobins, haptoglobins, and white cell antigens are omitted.

*—BRUCE H. SMITH, Capt., MC, USN*

DENTISTRY FOR CHILDREN, by *John C. Brauer*, D. D. S., A. B., M. Sc., F. A. C. D.; *William W. Demeritt*, D. D. S.; *L. B. Higley*, B. A., D. D. S., M. S., F. A. C. D.; *Roy L. Lindahl*, D. D. S., M. S.; *Maury Massler*, D. D. S., M. S.; and *Isaac Schour*, Ph. D., D. Sc. 4th edition. 492 pages; illustrated. McGraw-Hill Book Company, Inc., New York, N. Y., 1958. Price $11.

The contributors of this new edition have retained their purpose of producing a volume for students of dentistry on the undergraduate and graduate levels. Chapters are arranged and grouped into two sections on fundamental considerations and technical procedures. Many new

diagrams and illustrations have been added and the text has been brought up to date. Dental as well as medical practitioners, interested in pediatrics, will find a large part of this book applicable to everyday practice. Problems relating to the development of the teeth, preventive orthodontics, dental caries and its control, lesions and infections of the oral tissues, nutrition, and the endocrine glands warrant the interest and attention of both. It includes the latest findings in pulp and root canal therapy, cavity preparation, various restorative materials, denture service and construction, treatment and restoration of traumatized central incisors, and new uses for space maintainers. This reviewer believes that this edition will be accepted widely by the profession, particularly because of the six authors' significant past contributions to the advancement of the study of dentistry for children as clinicians, teachers, and authors. They have attempted to present material that will help develop a philosophy and operational procedure commensurate with present-day knowledge.

—*ROBERT N. BEST, Maj., USAF (DC)*

CLINICAL ENDOCRINOLOGY, by *Karl E. Paschkis,* M. D.; *Abraham E. Rakoff,* M. D.; and *Abraham Cantarow,* M. D. 2d edition. 941 pages; illustrated. Paul B. Hoeber, Inc., New York, N. Y., 1958. Price $18.

Endocrinology has become such a complex specialty in the past five or ten years that it is now virtually inconceivable that one individual could write an authoritative and comprehensive text. Consequently, most recent works have been a result of collaboration, occasionally with resultant areas of contradiction, overlap, and omission. The present volume suffers from none of these defects and is a welcome addition to other more familiar stand-bys in this field. The endocrine glands are considered individually in the conventional manner, with discussions of embryology, gross and microscopic anatomy and pathology, physiology, and diagnosis and treatment. Particular emphasis is placed on basic science and the pathologic physiology of clinical abnormalities is lucidly presented.

There are, however, a number of errors with respect to the clinical aspects of certain endocrinopathies that will require further editing. In the discussion of thyroid disease, the authors state that no case of myxedema coma treated with intravenous triiodothyronine has yet been reported, although this has been documented as early as 1956 in *Lancet.* The statement that the thyroid responds with increased radioiodine uptake to the thyroid-stimulating hormone in acute thyroiditis is misleading and inaccurate, and needs to be modified in the light of more recent studies than the one quoted. In the discussion of Cushing's syndrome, no mention is made of either rib or pelvic fractures that some investigators believe to be an even more consistent finding than osteoporosis. Many endocrinologists might take exception to the authors' suggestion that 10 to 20 mg of desoxycorticosterone acetate in oil be administered routinely in the treatment of Addisonian crisis. This reviewer personally feels that such a procedure could

be harmful in view of the untreated Addisonian's known sensitivity to this material, the concomitant administration of salt, and the problem of irregular and delayed absorption from intramuscular depot sites in protracted hypotension. Proper attention is not accorded the newer synthetic steroid derivatives in the treatment of chronic adrenal insufficiency and, in general, the discussion of the use of steroids in nonendocrine states is deficient.

The historical approach is preserved and references are for the most part complete and up to date. In the discussion of hypoglycemia, however, no reference is made to Whipple's triad, and the most outstanding review on the subject is not included in the bibliography, although it appeared in the *American Journal of Medicine* in 1955. The 200 pages devoted to the endocrinology of the ovary and the placenta are superb and far surpass coverage of the subject in any available text. The chapter on laboratory methods and commercially available hormone preparations are other distinguishing features. This volume will be of considerable value to the student and practitioner, but its greatest usefulness may possibly be to the gynecologist and obstetrician who are physiologically oriented, or the internist with a particular interest in these specialties.

—*PAUL J. ROSCH, Capt., MC, USA*

A SYNOPSIS OF SURGICAL ANATOMY, by *Alexander Lee McGregor,* M. Ch., F. R. C. S., with a foreword by Sir *Harold J. Stiles,* K. B. E., F. R. C. S. 8th edition. 808 pages; 766 illustrations by Dr. *E. A. Thomas.* The Williams & Wilkins Company, Baltimore, Md., 1957. Price $7.

The avowed purpose of the author is to present practical anatomy to the surgeon in training and to the student as a supplement to classical textbooks. This volume is in two parts, the anatomy of the normal and of the abnormal. In this new edition the sections on adrenalectomy, injuries to the lymph ducts, and paraganglioma are new and other sections have been revised. The chapters in each part are separate essays dealing with a region, organ, or system. Although the anatomic data are well presented and clearly illustrated, this book has some serious defects. The organization is somewhat difficult to follow and the index must be used extensively to find all the references to a particular subject, e. g., the hand is discussed in eight different chapters. The clinical applications are not adequate. Some have been clearly outmoded, as aberrant thyroid, and others have been much modified. Only about 10 per cent of the references to the literature are later than 1940. The section on adrenalectomy, although new in this edition, mentions only hypertension as an indication. The sections on the supporting tissues are well done. Although this book is admittedly intended only as a synopsis and supplement, it is difficult to use as a reference and much of the clinical work is outdated. In a field with many competitors this book suffers by comparison. —*PHILIP D. CRONEMILLER, Capt., MC, USN*

SURGERY AND SURGICAL NURSING, by *Edward S. Stafford,* B. A., M. D., F. A. C. S., and *Doris Diller,* B. A., M. A., R. N. 3d edition. 469 pages; illustrated with 174 figures. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $5.

The third edition of this book is a well-organized and well-written text, complete in every detail and illustrated by well-chosen photographs and drawings. Each chapter has cross references interspersed throughout, followed by an excellent bibliography. The early chapters deal with the fundamentals of surgery and surgical nursing. Next, the various subdivisions of surgery are considered. Special surgical nursing procedures are discussed in their proper places, thus eliminating unnecessary repetition. The reviewer recommends this book to residents in surgery as well as surgical nurses.

—*FERDINAND V. BERLEY, Capt., MC, USN*

DISINFECTANTS, Their Values and Uses, by *W. E. Finch,* with a foreword by *H. Berry,* B. Sc., F. P. S., F. R. I. C. 188 pages; illustrated. The Macmillan Company, New York, N. Y., 1958. Price $5.50.

The control of strains of resistant organisms has become so important that this book is a timely publication. With the ever-increasing urgency of developing methods to prevent cross infection in hospital wards, this work should be of great interest not only to researchers in the field and manufacturers of disinfectants but also to clinicians and surgeons. The author begins his book with a brief history of the practice of disinfection and devotes some time in the second chapter to formulation methods, with particular regard to the principles involved. The next chapters are devoted to the phenolic disinfectants, active quaternary ammonium compounds, and the hypochlorites. The remainder of the book brings out the practical application of the use of the knowledge gained in the previous chapters, *i. e.,* the best materials and methods used to obtain maximum germicidal results in hospitals including disinfection of instruments, materials, linens, furniture, buildings, and the skin of the patient. A final chapter deals with manufacture and standardization of disinfectants and a glossary of words and phrases in common use is added. This is a readable and informative treatise and should be of special value to laboratory workers, researchers, and those concerned with disinfection in hospitals.

—*CLARK P. JEFFERS, Capt., MC, USN*

BASIC CARDIOLOGY, by *T. E. Gumpert,* M. B., Ch. B., F. R. C. P. 169 pages; illustrated. The Williams and Wilkins Co., Baltimore, Md., 1958. Price $6.

This concise presentation of basic cardiology consists, for the most part, of lectures given by the author in medical school and to postgraduate students. It is not intended to take the place of a standard textbook of cardiology, but was published to bridge the gap that exists between the detailed descriptions by the specialist and the accounts to be found in the standard textbooks of internal medicine. All major aspects of heart disease are described in a clear, accurate, brief, and concise manner. The therapeutic measures are adequately discussed and are current. The illustrations utilized are well selected, and roentgenograms of the various types of heart diseases are particularly well chosen to assist the reader in understanding the material

presented. Many cardiac disorders are illustrated graphically by the electrocardiograms, and these add clarity to the presentation. The format of the book is excellent and logical, and the text is well edited. Despite its brevity, this volume presents a concise, accurate, and quite complete synopsis of the subject of basic cardiology that should be beneficial to medical students, general practitioners, and to other practicing physicians.—*RALPH D. ROSS, Capt., MC, USN*

MODERN TRENDS IN ANESTHESIA, edited by *Frankis T. Evans*, M. B., B. S., F. F. A. R. C. S., D. A., and *T. Cecil Gray*. 22 contributors. 331 pages; illustrated. Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, N. Y., 1958. Price $15.

The editors of this book have endeavored to collect all recent knowledge of anesthesia in some 300 pages. Of the 22 contributors, 18 are English, one is Swedish, one Canadian, and two are Americans. All are recognized investigators in their respective fields. The material is well organized and summarizes the current knowledge of pharmacology and physiology as it affects anesthesia. The pharmacology and mode of action of the newer drugs, the relaxants and the phenanthrene group, are covered briefly. The newer methods used as adjuncts in surgery, such as hypothermia, hypotension, and extracorporeal circulation, are discussed. The complications and the pathology associated with anesthesia are presented concisely. This is not a book for beginners; the scope of the material covered makes it difficult reading. It is an excellent book for the teacher who must prepare lectures for residents. The extensive bibliography is one of the most valuable features of the book.—*DANIEL M. PINO, Capt., MC, USN*

A TEXT-BOOK OF X-RAY DIAGNOSIS, by British Authors in Four Volumes. Volume III. Edited by *S. Cochrane Shanks*, C. B. E., M. D., F. R. C. P., F. F. R., and *Peter Kerley*, C. V. O., C. B. E., M. D., F. R. C. P., F. F. R., D. M. R. E. 3d edition. 883 pages; 802 illustrations. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $23.

This third volume, that deals with the abdomen, exhibits all the fine qualities of the earlier editions; namely, succinct style of writing without verbosity, clarity of its many illustrations, and detailed descriptions of the numerous items of roentgenologic interest. This particular volume covers the alimentary tract including salivary glands, the biliary tract, the urinary tract, the remaining abdominal viscera, and the roentgen aspects of obstetrics and gynecology. Among the revisions are more detailed descriptions of esophagitis and peptic ulceration of the esophagus, renal arteriography, and the pharmacology of certain radiographic contrast media, notably cholografin and hypaque sodium. A number of new illustrations have been added. The chapters on the pathologic biliary tract and the radiology of the placenta are largely rewritten, and there are minor revisions in the chapter on pelvimetry. Although the book fulfills the hopes of the editors in reflecting the best current practices of diagnostic roentgenology, this reviewer does not share the feeling that the improvements over the second edition are of such great importance, number, and magnitude as to require the publication of a new, expensive edition.

—*HARRY L. BERMAN, Col., MC, USA*

PEDIATRIC CLINICS OF NORTH AMERICA. Volume 5, Number 3: Symposium on Behavior Disorders, *Harry Bakwin*, M. D., Consulting Editor. Published quarterly. 834 pages. W. B. Saunders Company, Philadelphia, Pa., 1958. Subscription price: $15 per year.

This issue of *Pediatric Clinics* consists of 16 articles written by various authors in the field. The subjects deal with such practical problems as office management of everyday problems, drug therapy, eating difficulties, obesity, sleep disturbances, school phobia, mental retardation, the brain-damaged child, the psychological aspects of asthma, constipation, masturbation, and problems of the adolescent, as well as possibly the more serious problems of schizophrenia, autism, and juvenile delinquency. Another clinic on the entirely unrelated subject of neonatal candidiasis consisting of 14 pages is also included. The authoritative position of the authors is recognized and each does a remarkably good job of introducing the subject under discussion. As is true with symposia in general, however, the lack of completeness should be mentioned. For example, only 13 pages is devoted to the large subject of "Problems of the Adolescent." These deficiencies may be considered to be adequately covered by a large number of references following each article. Special mention should be made of the excellence of "The Management of Mental Retardation," "Behavioral Syndrome Associated with Brain Damage" and "Office Management of Everyday Problems." Every physician who reads this symposium, particularly the ones interested in the care of the child as a whole, will realize his obligations to the child, enjoy a greater understanding of behavior problems in general, and possibly be better equipped for management of them when indicated.

—*ODGEN C. BRUTON, Col., MC, USA*

LIGAMENT AND TENDON RELAXATION (SKELETAL DISABILITY) TREATED BY PROLOTHERAPY (FIBRO-OSSEOUS PROLIFERATION), with special reference to Occipito-Cervical and Low Back Disability—Trigger Point Pain, Referred Pain, Headache and Sciatica, by *George Stuart Hackett*, M. D., F. A. C. S. 3d edition. 151 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $6.75.

This is a somewhat lengthy dissertation on the author's use of sclerosing solutions (he prefers to call them "proliferants") blindly injected into the fibro-osseous junctions of tendons and ligaments with bone. His thesis is that stress from trauma, poor posture and overweight, causes back ache by producing pain in the numerous joints throughout the osseous complex of spine, sacrum and ilium and, that this pain is due to "relaxation" of ligaments in which inelastic nerve fibers are stretched. No contraindications are given to the injection of two proliferants, sylnasol, and a zinc sulfate-phenol-pontocaine solution. This would win few supporters among those experienced with complications associated with blind injection of sclerosing solutions, especially those containing phenol. One wonders if the book does not condemn itself in the statement: "We can no longer accept as accurate clinical observations that are without scientific basis."

—*WALTER R. MILLER, Capt., MC, USN*

CIRCULATION, edited by *John McMichael*, M. D., F. R. C. P., F. R. S. 503 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $10.50.

This book is a compilation of the papers presented in 1957 at the Harvey Tercentenary Congress at the Royal College of Surgeons in London. The program presented the work of 60 outstanding authorities representing practically all disciplines interested in blood circulation. As appropriate in such a congress, a pleasant and necessarily all too short historical survey of Harvey's life and the results of his investigations comprise the first part of the book. The remainder of the text is devoted to a review of the present knowledge of the circulation, wherein investigators, physiologists, clinicians and surgeons present concise summaries of work which, in many cases, was performed in their own laboratories. An interesting feature is the inclusion of the transatlantic radio-telephone discussion held between members of a panel in London and another at the annual meeting of the American Medical Association in New York, which followed the presentation of the papers on cardiac surgery. The tables and illustrations are uniformly good throughout the book and are especially valuable in permitting a non-French speaking reader to understand the only one of the papers not written in English. This volume is recommended to all interested in the study of the circulation, from the casual reader of medical history to the investigator who wishes a nonparochial survey of the entire field.—*M. S. WHITE, Brig. Gen., USAF (MC)*

CALLANDER'S SURGICAL ANATOMY, by *Barry J. Anson*, M. A., Ph. D., and *Walter G. Maddock*, M. S., M. D., F. A. C. S. 4th edition. 1,157 pages; 1,047 illustrations. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $21.

The fourth edition of this well-known standard text follows the general format of its predecessors, significant changes being based on fairly recent developments in the field of surgery. The book attempts to be all things to all men, with the result that there are bones for all but meat for few. To be more specific, the book discusses the anatomy, physiology, and embryology of problems in many surgical specialties and, thereby, as a result of the limitations imposed by space, much material is sketchily presented. For instance, bronchiectasis is disposed of with two paragraphs and carcinoma of the lung with four. The brief discussion of cardiac surgery is obsolete. On the other hand items of particular interest to the author, such as the vagaries of the blood supply to the diaphragm, receive much more space than their importance warrants. A fairly complete discussion of the subject of diaphragmatic hernia does not mention Humphry's classic contribution, and fig. 276 does not agree with the written description of the esophageal hiatus. In many instances, there is a mixture of both English and Latin nomenclature to explain a figure. This text is valuable as a reference as it generally gives the source of the material it condenses. It will be of most interest to undergraduates and to those beginning their postgraduate training.

—*DAVID E. THOMAS, Lt. Col., MC, USA*

EYE SURGERY, by *H. B. Stallard*, M. B. E., M. A., M. D. (Cantab.), F. R. C. S. (Eng.), Hon. LL. D. (St. Andrews). 3d edition, revised. 899 pages; 671 illustrations. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $18.

This book describes the details of operations which have an established place in ophthalmic surgical practice. The author does not present an exhaustive treatise or detailed analyses of every surgical procedure but describes procedures he has found most effective in his experience and practice. The third edition of this book has been extensively rewritten. There are 671 illustrations, clearly drawn or photographed, which augment the written descriptions of surgical procedures. The chapter on anesthesia has been brought up to date, and includes descriptions of the administration of basal narcotics, curare and the hexamethonium compounds. Here is a complete, concisely written textbook of eye surgery that is recommended to the beginning ophthalmologist as well as the more experienced eye surgeon.

—*JESSE H. SUITOR, Capt., MC, USN*

PHYSICAL EXAMINATION OF THE SURGICAL PATIENT, by *J. Englebert Dunphy*, M. D., F. A. C. S., and *Thomas W. Botsford*, M. D., F. A. C. S. 2d edition. 375 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $8.

With the emphasis in modern medicine on complex laboratory diagnostic procedures, the art of personal rapport with the individual patient and his thorough examination is becoming less common with the practitioners of medicine. This book has been written to focus the attention of the student and practitioner on the elementary principles and importance of eliciting the physical signs in surgical conditions. Although some attempt is made to correlate the physical signs with the pathologic processes producing these signs, it is, of course, impossible to do so thoroughly in a volume of this size. The book is divided into discussion of the elective examination and of the emergency examination. Both are well written in clear and concise language. The second part would appear to be of more value. The procedures of examining an injured patient are well presented in a form not readily available in the usual textbooks of surgery. Students, interns, and junior trainees in a surgical program should find this book of considerable help in organizing and orienting their thoughts and procedures in the examination of surgical patients.—*CLINTON S. LYTER, Col., MC, USA*

SURGERY OF THE HEAD AND NECK, by *Robert A. Wise*, M. D., and *Harvey W. Baker*, M. D. 319 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1958. Price $9.75.

Surgery of the head and neck conceivably ranges from ventriculocisternostomy to anterior fusion of the lower cervical vertebral bodies, and from corneal transplant to stapes mobilization. These examples are from the legitimate and virtually exclusive preserves of established specialties, but there is much in the head and neck which is still properly within the province of the general surgeon. This book was written for the general surgeon. It treats of skull fracture and

skin tumors; the Estlander lip and mandibulectomy; epistaxis and branchial cleft cyst; anterior mediastinotomy and fishbones in the throat. The text and illustrations are in the well-known style of former handbooks—pertinent, clear, and brief. The book should be of particular value to any general surgeon who is not already an accomplished expert in the area of the head and the neck—the result either of an overspecialized residency system, or a lack of continuing clinical experience. The book will not make him an expert, but it will better prepare him for the cases that do demand his attention.

—*DOUGLAS LINDSEY, Lt. Col., MC, USA*

DIAGNOSTIC BACTERIOLOGY, by *Isabelle G. Schaub,* A. B.; *M. Kathleen Foley,* M. A.; *Elvyn G. Scott,* M. T. (ASCP); and *W. Robert Bailey,* Ph. D. 5th edition. 338 pages; illustrated. The C. V. Mosby Company, St. Louis, Mo., 1958. Price $4.75.

This excellent manual for the journeyman medical bacteriologist remains as perhaps the best source of diagnostic minutiae available. To this the authors have added a fathomable section on diagnosis of mycotic infections which incorporates most of the Conant drawings from his manual, *Clinical Mycology.* Other new material includes a reworking of the entire section on gram-negative rods with special attention to the *Paracolobactrum.* Possibly, in light of author Schaub's contribution to our information on *Bacterium anitratum,* some effort might have been expended in differentiating *Mima polymorpha* from the *Herellea* species because these organisms are being isolated more often from pathologic processes. For the physician desiring an easy, readable guide to isolation and identification of pathogenic bacteria and fungi, this work is current and choice.

—*CHARLES D. GRABER, Lt. Col., MSC, USA*

TUMORS OF THE ORAL REGIONS, edited by *Hamilton B. G. Robinson,* D. D. S., M. S. 143 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $3.

This is an excellent and timely symposium on oral cancer, emphasizing the role of the dentist in its recognition, diagnosis and early treatment. Written by recognized authorities, the major portion of the book is devoted to a review and discussion of the etiologic, clinical, roentgenologic, and microscopic findings of the many benign and malignant tumor lesions affecting the oral tissues. Where indicated, a concise but accurate evaluation of the most acceptable methods of treatment is likewise presented. The contributions are arranged so that each author presents the tumor growths of one specific area of the oral cavity. As an example, one presentation comprises tumors of the salivary glands; the next, tumors of the lips; and the third, tumors of the floor of the mouth. This format is continued throughout the book and should serve as a ready reference manual. This book is recommended as a brief but comprehensive symposium on oral tumors. As such, it should prove to be of great value to both the dental and the medical practitioner.—*ALEX M. MOHNAC, Lt. Col., USAF (DC)*

# New Books Received

Books received by the *U. S. Armed Forces Medical Journal* are acknowledged in this department. Those of greatest interest will be selected for review in a later issue.

TREATMENT OF BREAST TUMORS, by *Robert S. Pollack,* M. D., F. A. C. S. 147 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1958. Price $6.

ATLAS of TECHNICS in SURGERY, by *John L. Madden,* M. D., F. A. C. S., with 62 contributing authors. 648 pages; illustrated. Appleton-Century-Crofts, Inc., New York, N. Y., 1958. Price $30.

THE CARE OF THE GERIATRIC PATIENT, edited by *E. V. Cowdry.* 438 pages. The C. V. Mosby Company, St. Louis, Mo., 1958. Price $8.

THE DIVINE WIND, Japan's Kamikaze Force in World War II, by Captain *Rikihei Inoguchi* and Commander *Tadashi Nakajima,* Former Imperial Japanese Navy, with *Roger Pineau,* Commander, USNR. 240 pages; illustrated. U. S. Naval Institute, Annapolis, Md., 1958. Price $4.50.

CLINICAL NEUROLOGY, by *Bernard J. Alpers,* M. D., Sc. D. (MED.). 4th edition. 890 pages; 244 illustrations. F. A. Davis Company, Philadelphia, Pa., 1958. Price $11.50.

APPLIED MEDICAL LIBRARY PRACTICE, by *Thomas E. Keys,* A. B., M. A., with chapters by *Catherine Kennedy,* B. S., L. S., and *Ruth M. Tews,* B. S., L. S. 495 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $10.75.

PEDIATRIC METHODS AND STANDARDS, edited by *Fred H. Harvie,* M. D., 3d edition. 324 pages. Lea & Febiger, Philadelphia, Pa., 1958. Price $4.50.

MYASTHENIA GRAVIS, by *Kermit E. Osserman,* M. D., F. A. C. P. 286 pages; illustrated. Grune & Stratton, Inc., New York, N. Y., 1958. Price $10.

DEFICIENCY DISEASE, by *Richard H. Follis, Jr.,* M. D. 577 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $14.75.

ESSENTIALS OF CLINICAL NEUROANATOMY AND NEUROPHYSIOLOGY, by *John T. Manter,* Ph. D., M. D. 147 pages; illustrated. F. A. Davis Company, Philadelphia, Pa., 1958. Price $3.

RUSSIAN-ENGLISH BIOLOGICAL & MEDICAL DICTIONARY, by *Eugene A. Carpovich.* 398 pages. Technical Dictionaries Company, New York, N. Y., 1958. Price $12.

ORAL ROENTGENOGRAPHIC DIAGNOSIS, by *Edward C. Stafne,* D. D. S., F. A. C. D. 303 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $14.50.

PEDIATRIC CLINICS OF NORTH AMERICA, Symposium on Pediatric Cardiology, November 1958. *Alexander S. Nadas,* M. D., Consulting Editor. 1,234 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1958. Price $15 per year of 4 books issued quarterly. Sold only by a year of four consecutive numbers.

DENTAL CLINICS OF NORTH AMERICA, Symposium on Dental Materials—Their Use and Recent Developments, November 1958. *Ralph W. Phillips,* M. S., Consulting Editor. 821 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $4.50.

THE YEAR BOOK OF OBSTETRICS AND GYNECOLOGY (1958-1959), by *J. P. Greenhill,* B. S., M. D., F. A. C. S., F. I. C. S. (Honoraty). 607 pages; illustrated. Year Book Publishers, Inc., Chicago, Ill., 1958. Price $7.50.

ANNALS OF THE NEW YORK ACADEMY OF SCIENCES, Volume 73, Article 3, pages 539-868, October 7, 1958. Editor-in-Chief, *Otto V. St. Whitelock.* Managing Editor, *Franklin N. Furness.* Associate Editor, *Peter A. Sturgeon.* "Third Tissue Homotransplantation Conference." Consulting Editor, *Blair O. Rogers.* Published by The New York Academy of Sciences, New York, N. Y., 1958.

ANNALS OF THE NEW YORK ACADEMY OF SCIENCES, Volume 75, Article 1, pages 1-384, October 13, 1958. Editor-in-Chief, *Otto V. St. Whitelock.* Managing Editor, *Franklin N. Furness.* Associate Editor, *Peter A. Sturgeon.* "Enzymes in Blood." Consulting Editor, *Laurens P. White.* Published by The New York Academy of Sciences, New York, N. Y., 1958.

TREATMENT OF CANCER AND ALLIED DISEASES. Volume 1, edited by *George T. Pack,* M. D., F. A. C. S., and *Irving M. Ariel,* M. D., F. A. C. S. Fifty-five authors. 2d edition. 646 pages; illustrated. Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, N. Y., 1958. Price $22.50.

THE ARMY AIR FORCES IN WORLD WAR II. Volume 7. Services Around the World. Prepared under the editorship of *Wesley Frank Craven* and *James Lea Cate,* by the U. S. Air Force Historical Division of Research Studies Institute, Air University, Colonel Garth C. Cobb, USAF, Director; Albert F. Simpson, Air Force Historian. 667 pages; illustrated. The University of Chicago Press, Chicago, Ill., 1958. Price $8.50.

THE CIRCULATION OF THE BLOOD. Two Anatomical Essays, by *William Harvey,* together with nine letters written by him. The whole translated from the Latin by *Kenneth J. Franklin.* 184 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $4.50.

EPILEPSY, by *Manfred Sakel,* M. D., with a Preface by *Otto Poetzl.* 204 pages. Philosophical Library, New York, N. Y., 1958. Price $5.

DIFFICULT DIAGNOSIS. A Guide to the Interpretation of Obscure Illness, by *H. J. Roberts,* M. D. 913 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $19.

POISONS. Properties, Chemical Identification, Symptoms and Emergency Treatment, by *Vincent J. Brookes* and *Morris S. Jacobs,* Ph. D. 272 pages; illustrated. D. Van Nostrand Company, Inc., Princeton, N. J., 1958. Price $6.50.

THE EYE. A Clinical and Basic Science Book, by *E. Howard Bedrossian*, B. S., M. D., M. Sc. (MED.), F. A. C. S. Foreword by *Edmund B. Spaeth*, M. D. 340 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $11.

OPHTHALMIC FITTING AND ADJUSTING, by *Frank Kozol*, B. S., O. D. 155 pages; illustrated. Chilton Company, Philadelphia, Pa., 1958. Price $6.50.

SO YOU HAVE GLAUCOMA, by *Everett R. Veirs*, M. D., 64 pages; illustrated. Grune & Stratton, Inc., New York, N. Y., 1958. Price $2.75.

ELEMENTS OF BIOPHYSICS, by *James E. Randall*, B. S. E. E., M. S., Ph. D. 333 pages. The Year Book Publishers, Inc., Chicago, Ill., 1958. Price $8.

ANATOMY AND PHYSIOLOGY. Laboratory Manual and Study Guide, by *Irene McKean*, B. S., R. N. 193 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $3.

TRIFLUOPERAZINE. Clinical and Pharmacological Aspects, by *Henry Brill*, M. D. 219 pages. Lea & Febiger, Philadelphia, Pa., 1958. Price $3.50.

AMID MASTERS OF TWENTIETH CENTURY MEDICINE, by *Leonard G. Rowntree*, M. D., with an introduction by *George F. Lull*, M. D. 684 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $11.50.

ELECTROLYTE CHANGES IN SURGERY, by *Kathleen E. Roberts*, M. D.; *Parker Vanamee*, M. D.; and *J. William Poppell*, M. D. 113 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $4.50.

A TEXT-BOOK OF ORTHODONTIA, by *Robert H. W. Strang*, M. D., D. D. S., and *Will M. Thompson*, B. S., D. D. S. 4th edition, thoroughly revised. 880 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1958. Price $20.

SURGERY OF THE HEAD AND NECK, by *Robert A. Wise*, M. D., and *Harvey W. Baker*, M. D. 319 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1958. Price $9.75.

HEREDITY OF THE BLOOD GROUPS, by *Alexander S. Wiener*, A. B., M. D. F. A. C. P., F. C. A. P., and *Irving B. Wexler*, A. B., M. D., F. A. C. P. 150 pages. Grune & Stratton, Inc., New York, N. Y., 1958. Price $6.

RADIOLOGY for Medical Students, by *Fred Jenner Hodges*, M. D., *Isadore Lampe*, M. D., *John Floyd Holt*, M. D. 3d edition. 450 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1958. Price $8.50.

DISEASE, LIFE, AND MAN. Selected Essays by *Rudolf Virchow*. Translated and with an Introduction by *Lelland J. Rather*. Stanford Studies in the Medical Sciences, IX. 273 pages. Stanford University Press, Stanford, Calif., 1958. Price $5.

CARDIOVASCULAR SOUND IN HEALTH AND DISEASE, by *Victor A. McKusick*, M. D. 570 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $15.

SELF-DESTRUCTION. A Study of the Suicidal Impulse, by *Beulah Chamberlain Bosselman*. 94 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $4.75.

THE RECOVERY ROOM. A Symposium, by *John Adriani*, M. D., and *John B. Parmley*, M. D. American Lecture Series, Publication No. 340, A Monograph in American Lectures in Anesthesiology. 123 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $4.25.

EVOLUTION OF THE SPEECH APPARATUS, by *E. Lloyd DuBrul*, D. D. S., Ph. D. American Lecture Series, Publication No. 328, A Monograph in American Lectures in Anatomy, edited by *Otto F. Kampmeier*, Ph. D., M. D. 103 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $4.75.

CONVULSIVE DISORDERS OF CHILDREN, by *Dora Hsi-Chih Chao*, M. D.; *Ralph Druckman*, M. D.; and *Peter Kellaway*, M. D., Ph. D. 151 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $6.

THE PRACTICE OF SANITATION, by *Edward Scott Hopkins* and *Wilmer Henry Schulze*. 3d edition. Foreword by *Abel Wolman*. 487 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $8.

METHODS FOR RESEARCH IN HUMAN GROWTH, by *Stanley M. Garn*, Ph. D., and *Zvi Shamir*, M. D., M. P. H. Foreword by *A. Ashley Weech*, M. D. 121 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $4.75.

PRACTICAL BLOOD TRANSFUSION, by *J. D. James*, M. R. C. S., L. R. C. P., with a foreword by *P. L. Mollison*, M. D., F. R. C. P. 187 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. price $4.50.

SENSITIVITY REACTIONS TO DRUGS. A Symposium organized by The Council for International Organizations of Medical Sciences, edited by *M. L. Rosenheim* and *R. Moulton*, and assisted by *S. Moeschlin* and *W. St. C. Symmers*. 237 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $7.

CLINICAL OBSTETRICS AND GYNECOLOGY, Volume 1, Number 3, September 1958. A quarterly book series. Symposium on Special Diagnostic Aids, edited by *C. Paul Hodgkinson*, M. D.; and Symposium on Abnormal Uterine Bleeding, edited by *John L. Brewer*, M. D. 852 pages; illustrated. Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, N. Y., 1958.

PRINCIPLES OF CLINICAL ELECTROCARDIOGRAPHY, by *Mervin J. Goldman*, M. D. 2d edition. 342 pages; illustrated by *Ralph Sweet*. Lange Medical Publications, Los Altos, Calif., 1958. Price $4.50.

BREAST CANCER. The Second Biennial Louisiana Cancer Conference, New Orleans, January 22-23, 1958, edited by *Albert Segaloff*, M. D. Sponsored by the American Cancer Society, Louisiana Division, Inc. 257 pages; illustrated. The C. V. Mosby Company, St. Louis, Mo., 1958. Price $5.

ANATOMY FOR SURGEONS. Volume 3, The Back and Limbs, by *W. Henry Hollinshead*, Ph. D. 901 pages; illustrated. Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, N. Y., 1958. Price $23.50.

ESSENTIALS OF CLINICAL NEUROANATOMY AND NEUROPHYSIOLOGY. The Interpretation of Neurologic Signs and Symptoms in Clinical Medicine, by *John T. Manter*, Ph. D., M. D. 137 pages; illustrated. F. A. Davis Company, Philadelphia, Pa., 1958. Price $3.

SYSTEM OF OPHTHALMOLOGY. Volume 1, The Eye in Evolution, edited by Sir *Stewart Duke-Elder*, G. C. V. O., M. A., LL. D., Ph. D., D. Sc., M. D., D. M., F. R. C. S., F. R. C. S. E., F. A. C. S., F. R. A. C. S. 843 pages; illustrated. The C. V. Mosby Company, St. Louis, Mo., 1958. Price $27.50.

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